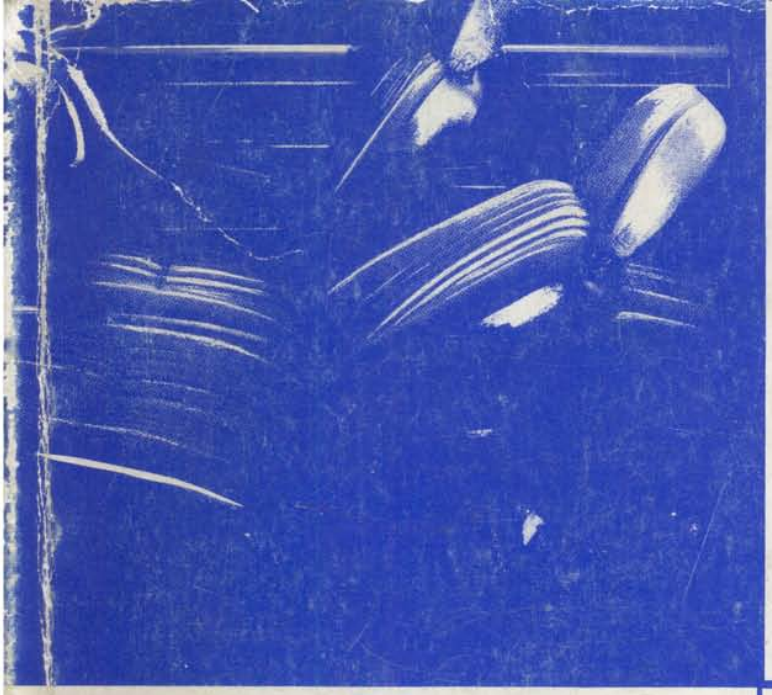
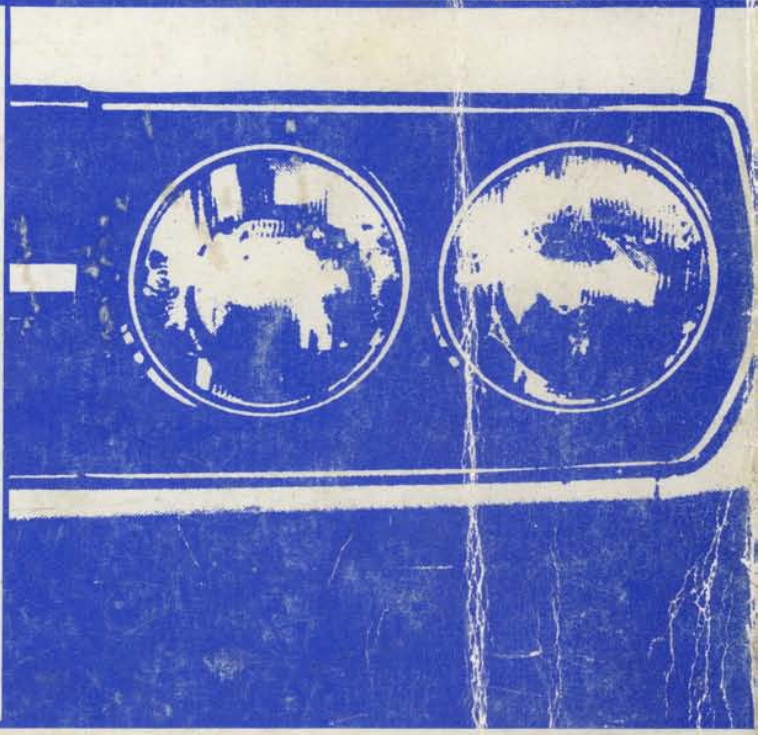


WORKSHOP MANUAL

SKODA 105 S, 105 L, 120 L, 120 LE, 120 LS and 120 LSE

PASSENGER CARS

Revised Edition 1980 version



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WORKSHOP MANUAL
of
SKODA 105 S, 105 L, 120 L, 120 LE, 120 LS and 120 LSE

PASSENGER CARS

REVISED EDITION

1980 VERSION

Reprinted in England by Jemtech Printing Company Limited, Otterbourne, Hampshire

The purpose of this workshop manual is to ensure perfect servicing and repairs of ŠKODA cars by acquainting you, the workers of car services, with the pertinent procedures.

The manual is divided into independent sections or chapters according to the fundamental function of the individual car mechanisms and systems, and/or the kind of information required. It includes descriptions of installation and removing as well as assembly and dismantling procedures, adjusting data, a list of tools and fixtures recommended by the manufacturer, etc.

Refer to the catalogue of spare parts as a supplement to the illustrations, which has been worked out in the same sequence. It will also help you to identify the minor design deviations of the individual production series.

Changes of procedures and supplements to the information contained in this manual are published currently in the ŠKODA Service Bulletins and they will, eventually, be incorporated in the next editions of the manual.

Manufacturer: MOTOR WORKS, National Corporation,
Mladá Boleslav

Exporter: MOTOKOV
Praha – Czechoslovakia

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1 - GENERAL TECHNICAL INFORMATION

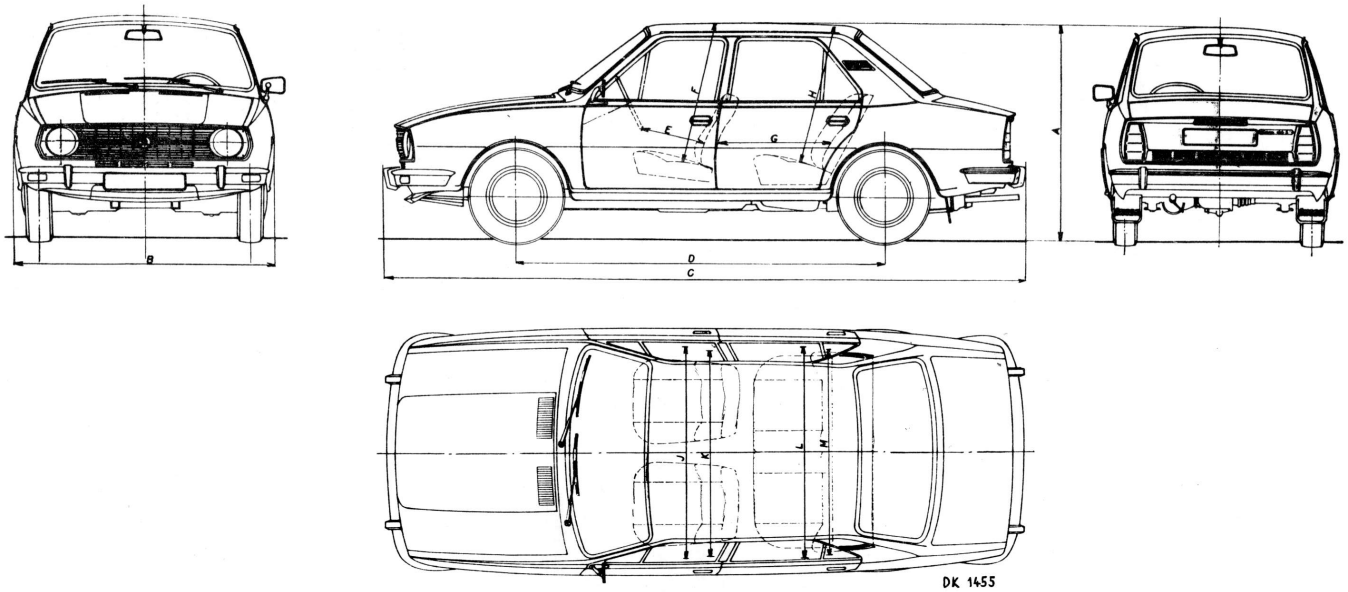


Fig. 1/1 Car Dimensional Drawing

A - Total height	1400	mm
B - Total width	1595	mm
C - Total length	4160	mm
D - Wheel base	2400	mm
E - Distance between steering wheel and seat backrest	400 $^{+\ 50}_{-100}$	mm
F - Distance between seat cushion and ceiling	900	mm
G - Distance between seat backrests	700 $^{+100}_{-\ 50}$	mm
H - Distance between seat cushion and ceiling	870	mm
J, L - Width at elbow height	1350	mm
K, M - Width at shoulder height	1320	mm

1.1 GENERAL CHARACTERISTICS OF CARS — U.K. VERSION

The Škoda 105 S is a five-seat car with a chassisless body, a rear spark-ignition petrol engine, and a driving rear axle. The radiator is in front.

Since 1978 105 S includes items 1, 2, 4, 8, 9, 10, 11.

ŠKODA 105 L is the ŠKODA 105 S car with refined appointments and extras, i. e.:

- wheel embellishers
- wind-up rear-door windows
- adjustable front seat backrests and headrests
- ashtrays in rear-door ponels
- decorative cover strips on door sills
- mouldings at bottom of window openings
- halogen headlamps
- automatic switching off of direction indicators
- instrument panel with circular dials
- switch of disability warning lights
- reversing lamp

ŠKODA 120 L is the ŠKODA 105 L car with boosted engine power (increased swept volume, etc.) and other refinements, for example halogen headlamps, asymmetric.

ŠKODA 120 LS is the ŠKODA 120 L car with further increased engine power (due to increased compression ratio, etc.) and incorporating the following extras:

- glossy frame around windows
- twin headlamps
- instrument panel with tachometer
- brake booster

All models fitted with Brake Servo since 1978.

Since 1979, 120 LE and 120 LSE uprated trim of basic 120 L and 120 LS.

1.2 IDENTIFICATION PLATES AND NUMBERS, KEYS

Identification plate and car identification number

The plate is affixed to the transverse wall of the luggage boot (main luggage compartment). It contains the name of the manufacturer, some of the technical data, the number of the engine and bodywork which is also the identification number of the car. The serial number of the body itself is stamped along the identification plate, or on the body left-hand longitudinal runner in the engine bay (in the point of jack fitting), and the engine number on the water pump flange.

Keys

Three keys are provided with the car: the door key, the ignition key for the switchbox with the steering lock, and the key for the fuel tank filler cap lock.

1.3 FUNCTIONAL CAR EQUIPMENT

Doors

Both front doors can be locked from outside with the key, all doors can be secured by inside press-buttons against opening from the outside. Inside handles are used for unlocking and opening them from inside.

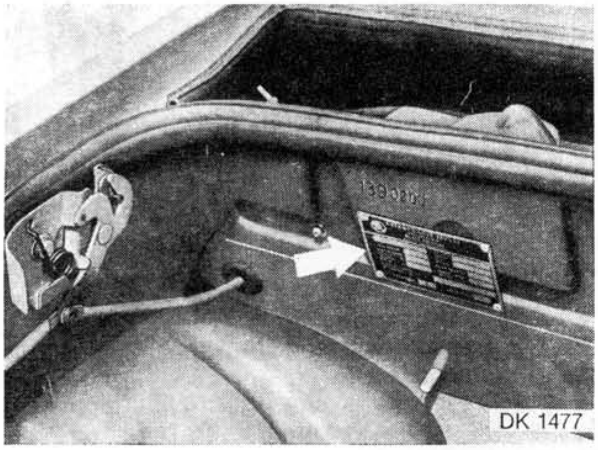


Fig. 1.2/1 Car Identification Plate

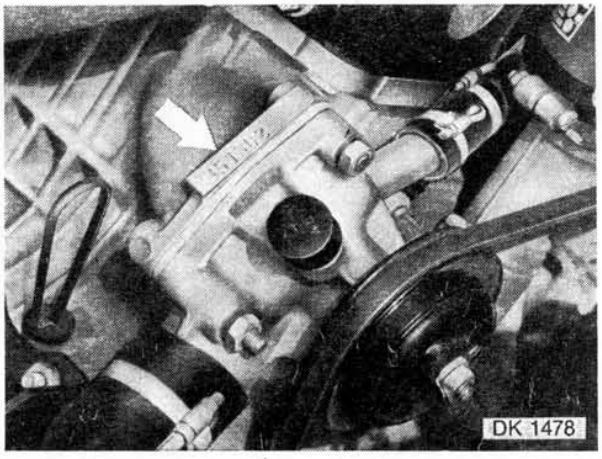


Fig. 1.2/2 Engine Serial Number

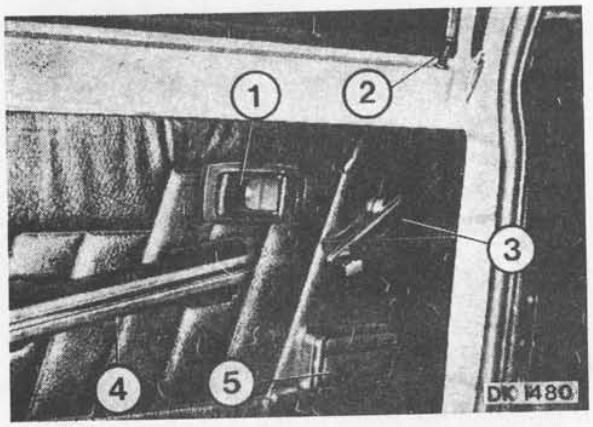


Fig. 1.3/1 Inside Door Mechanisms

1 - Handle
2 - Lock press-button
3 - Drop window crank
4 - Door pull
5 - Ashtray (depending on rear door outfit)

The child-proof latch of the rear doors can be engaged by tipping down its lever. The doors can be opened from outside after disengaging (unlocking) the latch by pulling the press-button.

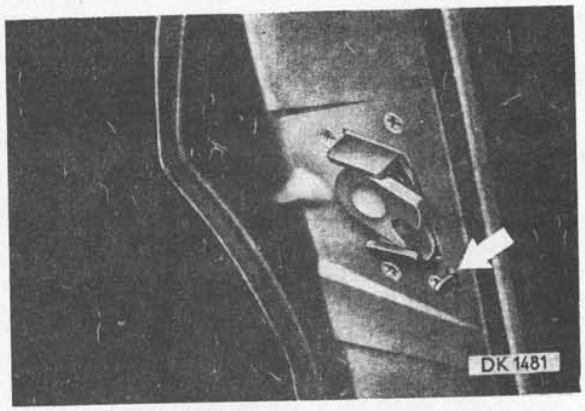


Fig. 1.3/2 Child-proof Latch

INSTRUMENT PANEL

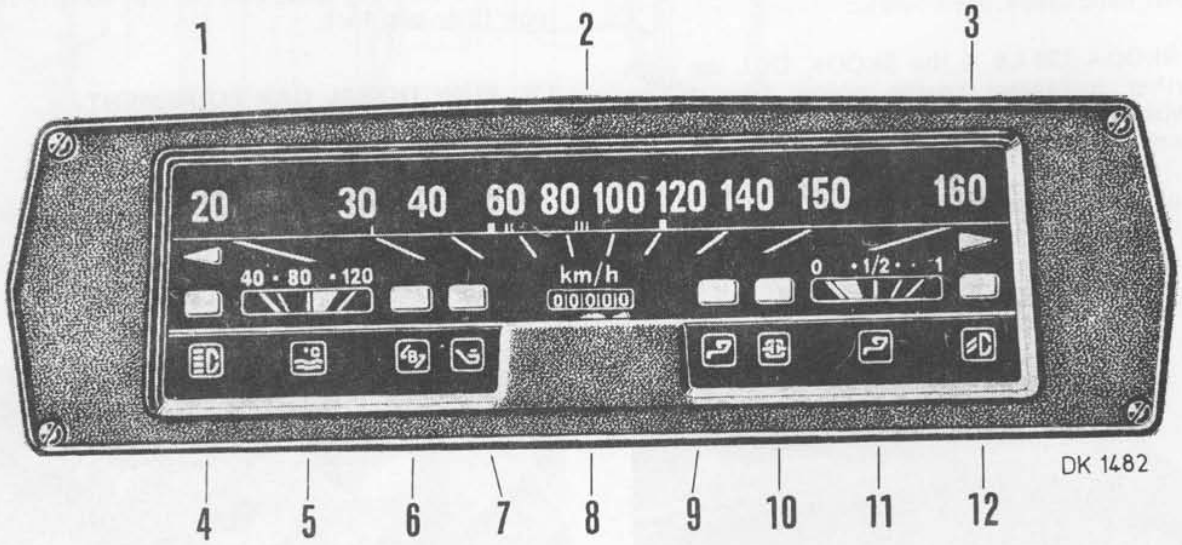
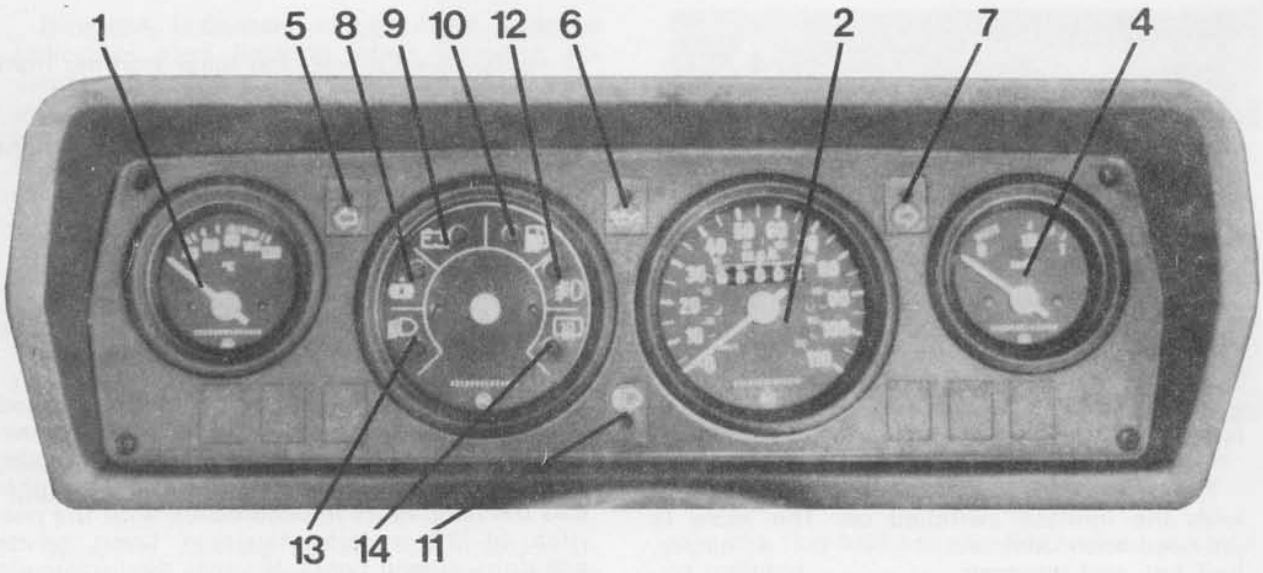


Fig. 1.3/3 SKODA 105 S Instrument Panel up to October 1978 only.

1 - Warning light of left-hand direction indicators, green
2 - Speedometer
3 - Warning light of right-hand direction indicators, green
4 - High-beam warning light, blue
5 - Thermometer (of engine cooling liquid)
6 - Charging warning light, red
7 - Oil pressure warning light, red
8 - Distance recorder
9 - Fuel reserve warning light, amber
10 - Brake system warning light, red
11 - Fuel gauge
12 - Unoccupied, green

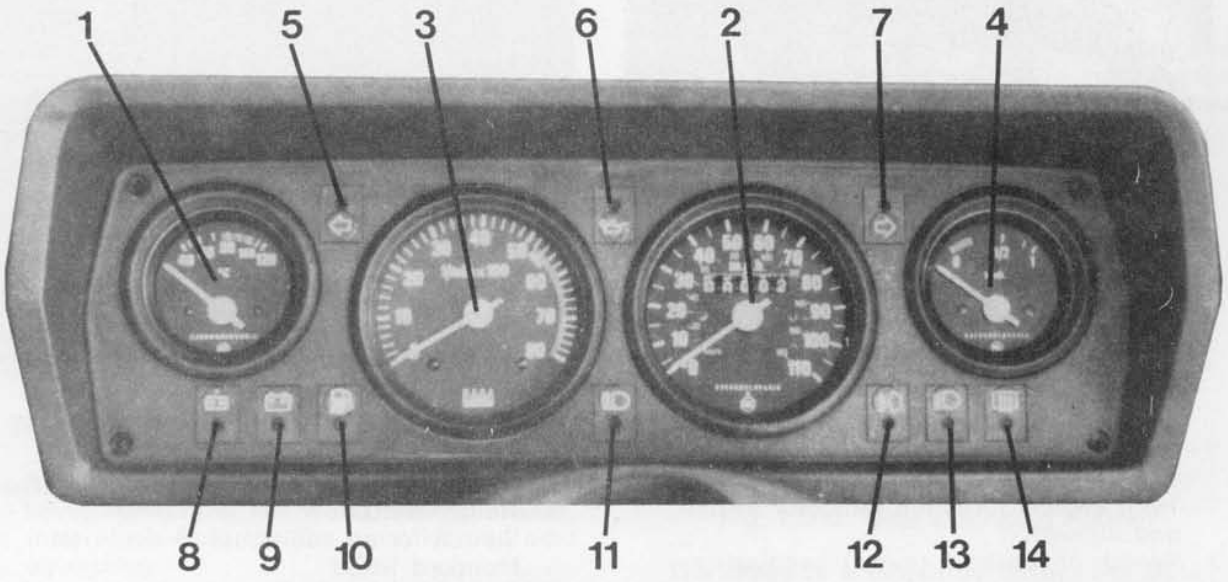


INSTRUMENT PANEL WITHOUT TACHOMETER

1 – Engine coolant thermometer
2 – Speedometer with distance recorder
3 – Tachometer (engine speed indicator)
4 – Fuel gauge

Warning Lamps

5 – Left-hand direction indicators – green
6 – Engine lubricating oil pressure – red
7 – Right-hand direction indicators – green
8 – Brake system – red
9 – Alternator operation – red
10 – Fuel reserve – orange
11 – High beam – blue
12 – Rear fog – orange
13 – Dip beam (not connected)
14 – Heated rear screen



INSTRUMENT PANEL WITH TACHOMETER

Warning lights:

5 - left-hand direction indicators, green
6 - oil pressure, red
7 - right-hand direction indicators, green
8 - brake system, red
9 - charging, red
10 - fuel reserve, amber
11 - high beam, blue
12 - unoccupied, green - fog lamp warning light included in special extras
13 - unoccupied, green - low-beam warning light included in special extras
14 - unoccupied, red

The thermometer indicates the temperature of the coolant with the ignition switched on. The optimum operating temperature range is from 75 to 105 °C. In ŠKODA 105 S, this range is identified by the green zone of the scale.

The fuel gauge indicates the level of the fuel with the ignition switched on. The scale is provided with divisions 0 - ½ - 1, i. e., empty, half full, and full tank.

The driver is warned by the red warning light when there are less than 5 litres of fuel in the fuel tank.

The tachometer indicates the speed (revolutions) of the engine. The speed should never rise to the red zone. When changing the gears, an increase of speed within the range of the yellow zone is permissible.

The parking lights come on when the switch is thrown to the first right-hand position. The switch switches on the headlamps, tail lights, and the licence plate light.

The headlights, i. e. driving (high beam) and dipped (low beam), are switched on by throwing the switch to the second right-hand position. The switch switches on all parking lights and the headlights in accordance with the position of the switch stem-type lever: centre position - dipped lights, towards the instrument panel - driving lights. When the driving lights are on, the blue warning light glows.

The auxiliary headlamps come on after pulling the switch knob, but only while main headlamps are on.

The headlamp flasher starts flashing when pulling the switch lever toward the steering wheel ring.

The horn is sounded by depressing the lever toward the steering wheel shaft.

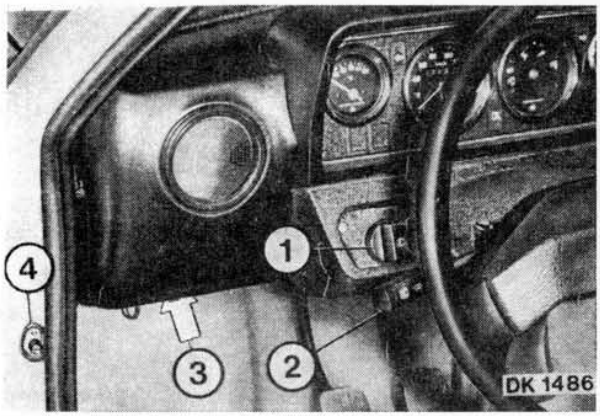


Fig. 1.3/6 Switches - part I

1 - Parking light switch and feeder of headlamp dipswitch
2 - Horn switch, direction indicator switch, and dipswitch
3 - Switch of auxiliary (extra) headlamps
4 - Door switch

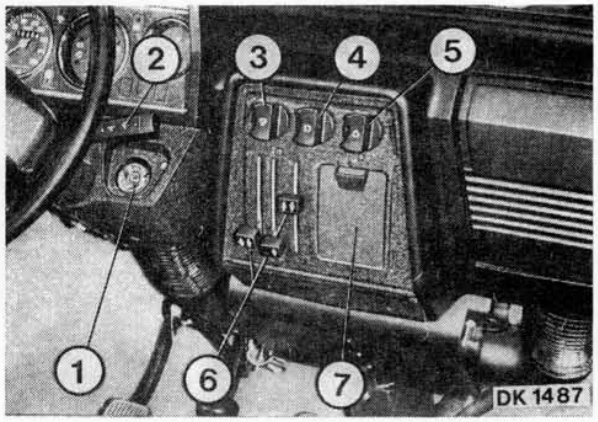


Fig. 1.3/7 Switches - part II and ashtray

1 - Switchbox and steering lock
2 - Switch of windscreen wipers and washer
3 - Heater switch
4 - Switch for an additional device - not standard fitted
5 - Disability warning light switch - not on ŠKODA 105 S
6 - Heater control
7 - Ashtray

Direction indicators - Right-hand direction indicators start flashing when throwing the switch lever upward, the left-hand indicators are actuated when throwing the lever downward. With the exception of ŠKODA 105 S, they switch off automatically after the turn is completed.

Windscreen wipers - With the switch lever pointing upwards, i. e. in position I, the wiper motor starts running at low speed, in position II (again upwards), the motor runs at high speed. The downward switching position of the lever is not occupied.

Windscreen washer - The pump is actuated when pushing the switch lever toward the steering wheel shaft.

Disability warning lights - All direction indicators and both direction indicator warning lights start flashing when turning the switch clockwise.

Heater - For heating and ventilation see Chapter 11.7.

Glove box - Push down the knob to open it.

Blowers of front door windows - The flow of hot or fresh air can be controlled by the flap installed in the mouth of the blower. When opening, press it down in the place marked with grooves; when directing the flow of air, take the flap between the fingers and rotate it as required.

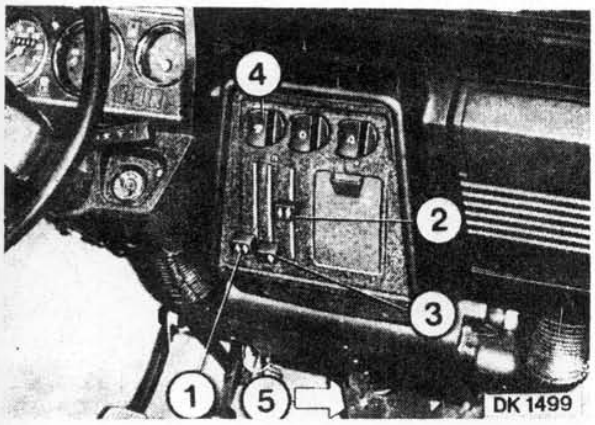


Fig. 1.3/8 Heater and Ventilation Controls

1 - Air distribution control lever
2 - Lever controlling hot water inlet to heater, inlet of air from the fan, and hot and cold air mixing
3 - Lever for shutting off air inlet into heater
4 - Two-position fan motor switch
5 - Lever controlling air inlet into floor tunnel and toward rear seats

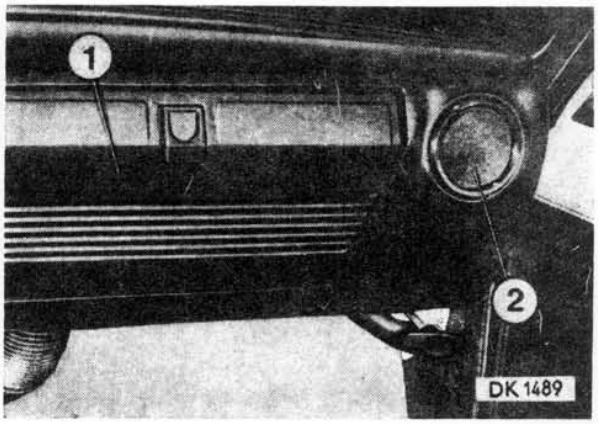


Fig. 1.3/9 Glove box (1) and Door-window blow-off duct (2)

Electric socket - Being installed under the facia panel on the left, it is permanently supplied with current.

See Fig. 13.1/2

CONTROLS AND AUXILIARY DEVICES

The steering wheel and pedals are of standard design (from left: clutch pedal, brake pedal, accelerator pedal).

The hand brake is applied by pulling the lever. To release the brake, first pull it and depress the press button on the lever top, then push it down as far as it will go.

Gear lever - Its positions for engaging the individual gears are shown in the gear change pattern: Figures 1 to 4 designate forward speed gears, "R" denotes the reverse gear.

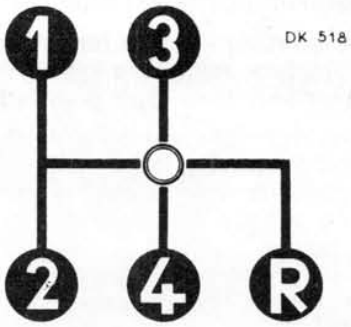


Fig. 1.3/10 Gear Changing Pattern

The choke is actuated by raising the lever.

The switchbox c/w steering lock interconnects the electrical equipment, starts the engine, and locks the steering.

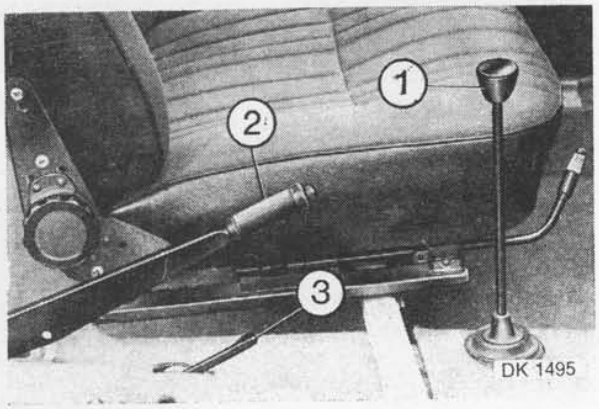


Fig. 1.3/11 Controls between Front Seats

1 - Gear lever
2 - Hand brake lever
3 - Choke

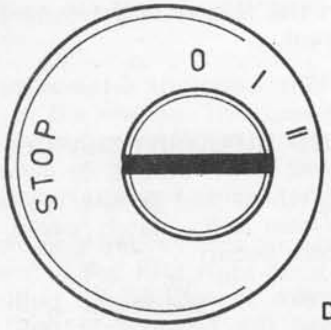


Fig. 1.3/12 Switching Positions of Switchbox c/w Steering Lock

0 - All functions off, engine stopping

I - Ignition on - ignition system and all parts of electrical equipment are supplied with current

II - Engine starting - before repeating the starting procedure, return the key to the "0" position and only then start the engine again

STOP - Position for withdrawing the ignition key and engaging the steering lock (after having withdrawn the ignition key, turn the steering wheel till the latch of the lock clicks home).
If the key cannot be turned when unlocking the steering, relieve the stress of the steering gear by turning the steering wheel slightly.

LUGGAGE AND ENGINE COMPARTMENTS

The main luggage compartment (boot) is in the forebody, the interior (inbuilt) luggage compartment behind the rear seat backrests.

Boot lid up to 1978 – To open it, press down the release on the right-hand side under the facia panel. Then lift the lid on the right-hand side and secure it in its raised position with the aid of the articulated strut. After lowering the lid, lock it by pulling the release as far as it will go.

Since 1978 open lid by pulling handle and lower as described above. To lock press lid above catches.

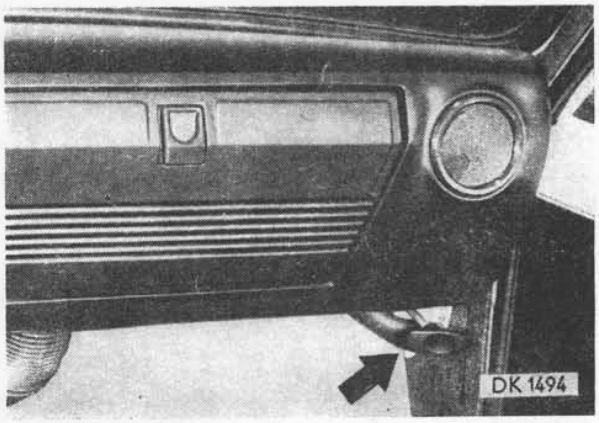


Fig. 1.3/13 Boot Lid Release

Engine bonnet - To open it, pull the lever in the aperture of the left-hand rear door. To close the bonnet, press it down with the hand into position.

For any work in the engine compartment see the notice in paragraph 1, Chapter 2.1.

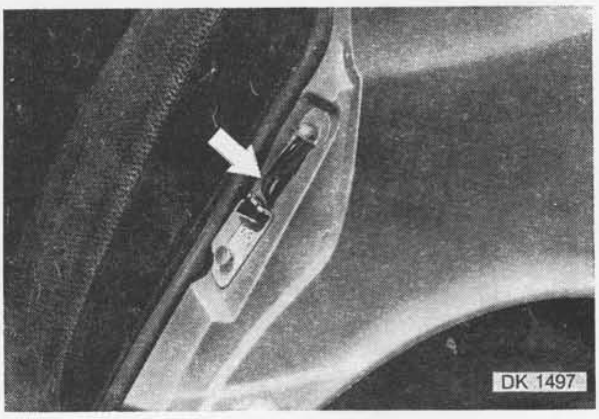


Fig. 1.3/14 Rear Bonnet Release Lever

SEATS, ADJUSTMENT AND CONVERSION

To make the seat slide, unlock it by lifting the lever and tilt the backrest by rotating the rosette.

To adjust the required height of the headrest (in Škoda 120 LS model or included in optional equipment) first unlock it an then pull it upward. Its maximum height is limited by a punch mark on its upright. The headrest must not be pulled out above the level of the fastening nuts.

The seats can be converted into berths. After removing the headrests, shift the seats to their foremost position and tip down the backrests.

By tipping over the rear seat backrests (after pushing off the levers behind the top edge of the backrests), access is gained to the interior luggage compartment. A loading platform is formed when tipping over also the rear seat cushions.

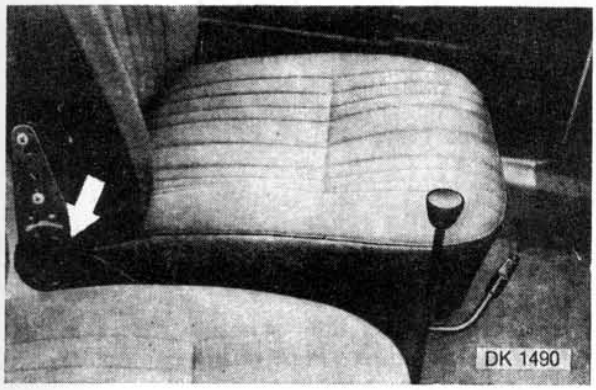


Fig. 1.3/16 Adjustment of front seats for leg-room and backrest rake adjustment (with the exception of ŠKODA 105 S)

Seat belts - see Chapter 14.11.

Courtesy lights are controlled automatically by the front door switches (with the type 105 S only on the driver's side). Moreover, a switch is provided direct on the lamps.

The ashtray in the facia panel can be removed after its opening (pull at its upper edge) by lifting it slightly while pulling it out. To put it back, insert it in its casing in the facia panel by its upper part first, lift it, and push it into position.

Ashtrays in the rear doors (with the exception of type 105 S) - To remove the ashtray, open it, push it down, tip its upper part out of its casing in the door, and disengage it from its hold in the casing by moving its lower part inward. When putting the ashtray back, insert first its lower part into the door, depress the ashtray and close it.

1.4 CAR JACKING UP AND TOWING

Jacking up with the hand jack - The hand jack is stowed in the engine compartment and held in position by means of a strap. Fit the jack into the jack bracket welded to the underbody on each side of the car.

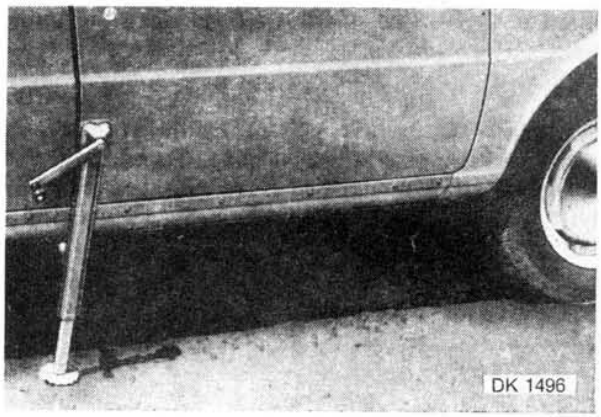


Fig. 1.4/1 Jacking up the Car with the Hand Jack

When jacking up the car, chock the wheels or apply the hand brake. Use chocks always on a slope.

When working under the car, place suitable supports under the door sills as shown in Fig. 1.4/2.

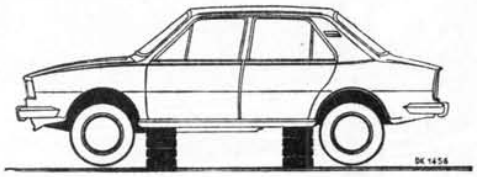


Fig. 1.4/2 Supporting the Car when Working under it

To stow away the jack, pull down the lifting arm till it rests against the foot, put the crank into the body runner section, and fasten the jack in position with the strap provided for this purpose.

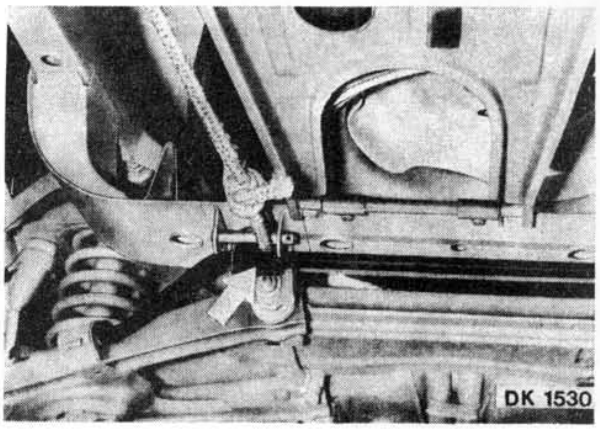


Fig. 1.4/3 Hooking of Towing Rope

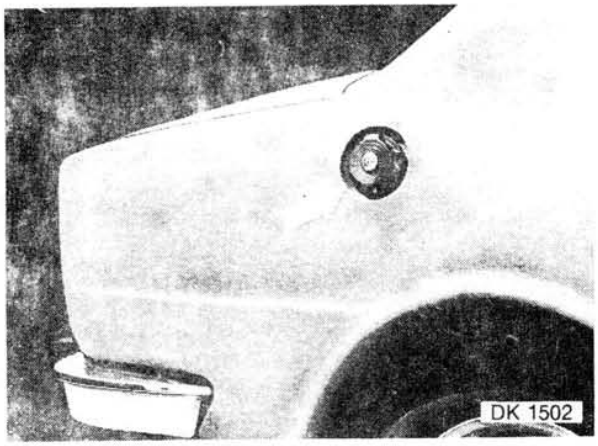
Lifting the car with a power jack - When using a service power jack, let the car rest on the points shown in Fig. 1.4/2.

To tow the car, hook the towing rope on to the bracket under the car nose. Thread the pin through the loop of the rope and the bracket lugs and secure the pin with a cotter pin (both the pin and the cotter pin are included in the car accessories).

1.5 SPARE WHEEL AND FUEL TANK

Spare wheel - After having opened the luggage boot lid, pull the handle of the spare wheel carrier release rod. The carrier is released and swings down (special equipment of the car includes a safety latch behind the bumper which has to be pushed aside to release the carrier).

Fig. 1.5/1 Handle of Spare Wheel Lock Release Rod (from above) and Safety Latch Lever



Fi. 1.5/2 Fuel Tank Filler Neck

After having closed the carrier (by lifting it), push the release lever under the bumper to the right as far as it will go.

Fuel tank - The filler neck with cap is in the rear on the right-hand side of the car. It can be locked and unlocked by means of the respective key.

1.6 STARTING THE ENGINE AND CHECKING ITS CORRECT RUNNING

1. Make sure that the gear lever is in its neutral position, switch on the ignition (position I on the switch box) and watch the coming on of the oil pressure and charging warning lights, i. e. check the function of the alternator - see the information in paragraph 4.

Prepare the engine for starting according to its temperature:

- Starting from cold in winter - do not touch the accelerator pedal and use the full choke
- Starting from cold in summer - do not touch the accelerator pedal and use only half of the choke
- Starting a warmed-up engine - depress the accelerator pedal slowly to the toe-board, do not touch the choke

2. Depress the clutch pedal (advisable in summer, necessary in winter) and start the engine by turning the ignition key to position II. Let go of the key as soon as the engine fires and release the accelerator pedal (if it has been depressed).

It the engine refuses to fire, return the key to the position "0" and repeat the starting procedure. If the engine is warmed up, depress the accelerator pedal to about one third of its total travel.

If the cold engine stalls even after the second and third starting attempt, enrich the starting mixture by quickly depressing the accelerator pedal once or twice to half of its travel during the next starting attempt.

Never let the starter motor run for more than about 5 seconds. Wait some 5 seconds before repeating the starting.

Fuel is injected by every quick depression of the accelerator pedal and enriches the mixture so that it is difficult to ignite. If the engine is flooded, start it with a fully depressed accelerator pedal.

3. Increase the engine speed carefully while releasing the clutch pedal. If the engine shows signs of stalling, depress again the clutch pedal.

Race the engine moderately and briefly to lubricate and warm it up. With a cold engine, half a minute will do in summer and about one minute in winter. This lubricating and warming-up period can be omitted if the engine is still warm and lubricated by a previous drive.

Never use the choke longer than necessary. Start closing the choke gradually soon after the engine has fired and close it fully when the engine shows no more signs of stalling.

4. When increasing the engine speed, make sure that the oil pressure and charging warning lights go out. If everything is in order, you can pull away with the car.

1.7 TECHNICAL DATA

Dimensions

Wheel Track.	Dependent on wheel equipment – Front/Rear	1280/1250 mm 1300/1270 mm 1310/1280 mm
Wheel base		2,400 mm
Ground Clearance		170 mm
Overall length		4,160 mm
Overall width		1,595 mm
Height of loaded car		1,400 mm approx.

Weights	Skoda 105 S	Skoda 105 L	Skoda 120 L	Skoda 120 LS
Empty weight	805 kg	825 kg	825 kg	825 kg
Curb weight	855 kg	875 kg	875 kg	885 kg
Payload	400 kg	400 kg	400 kg	400 kg
Gross-vehicle weight	1255 kg	1275 kg	1275 kg	1285 kg
Axle load ratings (of G.V.W. at normal car loading)				
Front axle	530 kg	540 kg	545 kg	540 kg
Rear axle	725 kg	735 kg	750 kg	750 kg

Permissable axle loads

Permissable loading of only one of the axles without exceeding the gross-vehicle weight rating.

Front axle	580 kg
Rear axle	780 kg

Running properties	Skoda 105 S 105 L	Skoda 120 L	Skoda 120 LS
Peak speed	130 km/hr	140 km/hr	150 km/hr
Maximum climable gradient	31%	34%	39%
Travelling range, approx.	550 km	480 km	440 km
Acceleration: 0 - 100 km/hr 1st through to 4th gear	23 sec	19 sec	17 sec
Basic fuel consumption MPG/LKM (UK Official Test Results)	1980 model		
Urban	31.7/8.9	32.5/8.7	33.2/8.5
56 mph	42.8/6.6	43.5/6.5	42.2/6.7
75 mph	—	31.4/9.0	29.1/9.7
Engine oil consumption, maximum	0.8 ltrs/1,000 km		
Turning circle diameters			
– outside wheel (centre line) track	10.2 m ± 5%		
– inside wheel (centre line) track	6.5 m ± 5%		
– between walls	11.0 m ± 5%		

ENGINE

Model	
– for Škoda 105 S and 105 L	Škoda 742.10 Engine No/1
– for Škoda 120 L	Škoda 742.12 Engine No/2
– for Škoda 120 LS	Škoda 742.12X Engine No/9
Type	four-stroke, spark-ignition, carburettor engine with overhead valves
Number of cylinders	4
Cylinder arrangement	in line
Cooling	pump-circulated antifreeze, thermostatic temperature control
Swept volume	
– Škoda 105 S and 105 L	1,046 c. c.
– Škoda 120 L and 120 LS	1,174 c. c.
Bore	
– Škoda 105 S and 105 L	68 mm
– Škoda 120 L and 120 LS	72 mm
Stroke	72 mm
Compression ratio	
– Škoda 105 S, 105 L and 120 L	8.5 : 1
– Škoda 120 LS	9.5 : 1
Engine power output to ČSN and DIN	
– Škoda 105 S and 105 L	33.9 kW (46 h. p.) at 4,800 r. p. m.
– Škoda 120 L	38.3 kW (52 h. p.) at 5,000 r. p. m.
– Škoda 120 LS	42.7 kW (58 h. p.) at 5,200 r. p. m.
Maximum torque	
– Škoda 105 S and 105 L	74.5 Nm at 3,000 r. p. m.
– Škoda 120 L	85.2 Nm at 3,000 r. p. m.
– Škoda 120 LS	90.2 Nm at 3,250 r. p. m.
Fuel - recommended octane number	
– Škoda 105 S, 105 L and 120 L	90 minimum
– Škoda 120 LS	95 minimum
Carburettor type	dual, two-stage, downdraught model JIKOV 32 EDSR
Fuel lift pump type	diaphragm pump, model JIKOV MF

CLUTCH

Type	dry, single-plate, with direct disengagement
Control	hydraulic

GEARBOX

Type	with helical spur gears
Speeds	4 forward and 1 reverse, synchrolock on the 1st-, 2nd-, 3rd-, and 4th-speed gears
Gear ratios - 1st-speed gear	3.8
2nd-speed gear	2.12
3rd-speed gear	1.41
4th-speed gear	0.96
reverse gear	3.27

REAR AXLE

Type	with swinging half-axles and independently suspended wheels
Constant-ratio final drive	spiral bevel gearing
Gear ratio	4.22 (normal ratio) 4.44 (mountain ratio)
Differential	bevel pinion type
Suspension	helical springs and telescopic shock absorbers
Rear wheel toe-in	see Chapter 5.5

FRONT AXLE

Type	with wishbones and independently suspended wheels
Suspension	helical springs with telescopic shock absorbers and torsion bar

Front axle (steering) geometry – see Chapter 6.1

STEERING

Type	direct, symmetrical, screw-and-nut steering with an independent track rod for each wheel
Steering gear ratio	17.3 : 1
Steering wheel diameter	380 mm
Maximum lock angle of nearside/farside wheel	29°30′/37°
Checking lock angle of nearside/farside wheel	20°/23° ± 45°
Number of steering wheel turns required for lock-to-lock movement	2.5

WHEELS

Number of wheels	4+1			
Rims	4½J x 14	4½J x 13	5J x 13	5½J x 13
Tyres	155 x 14	165 x 13		

Tyre pressures – see Chapter 10.1

BRAKES

Type	disk brakes front, internal expanding shoe-brakes rear
Foot brake	twin-circuit, direct-acting hydraulic or semi-servo hydro-pneumatic (Škoda 120 LS)
Hand brake	mechanical, direct-acting, cable-type, acting on rear wheels
Brake-shoe lining:	
– width, rear	40 ± 0.5 mm
– maximum thickness, rear	5 mm
– angular shoe-lining contact, rear	120°
– brake drum diameter, rear	230 mm
– effective brake-shoe lining area, rear	385 cm²
– brake disk diameter, front	252.5 mm
– effective braking area, front	76 cm²

Brake fluid:	
– classification	SAE J 1703 C
– brand filled-in in the factory	SYNTOL HD 190

FUEL TANK

Location	suspended under floor board of car rear half
Fuel cleaning (filtration)	strainer in fuel tank, fuel filter, and strainer in carburettor

CHASSIS LUBRICATION

Type	self-lubricating bearings, repacking with grease by grease nipples; wheel bearings packed with grease

ELECTRICAL EQUIPMENT

Earthing	negative pole
Rated voltage	12 volts
Service voltage	14 volts
Ignition	battery (coil) type
Storage battery	type AKUMA 6N 37 – 12 volts, 37 ampere-hours
Alternator	14V 35 amps 1976-79 105/120 L 14V 42 amps 1979 on 105/120 L 14V 42 amps 1976-79 120 LS 14V 55 amps 1979 on 120 LS
PAL Magneteton	type PAL Magneton, 14 volts
Voltage regulator	type PAL Magneton with centrifugal timing device and vacuum unit
Distributor	type PAL Magneton, 12 volts
Ignition coil	type PAL Magneton, 12 volts
Starter motor	0.66 kilowatts (0.9 h. p.)
Sparking plugs – see Chapter 13.7	

BODYWORK

Type	all-metal, closed, four-door, chassisless body
Seating capacity	5 occupants
Luggage compartments, capacity	0.40 m³ (0.28 m³ main luggage compartment for a load of about 40 kg, 0.12 m³ interior luggage compartment for a load of about 10 kg)
Heater	hot-water heater with fan, fed with water from the engine cooling system

FILLING CAPACITIES

Engine – Škoda 105 S, 105 L and 120 L	4 litres maximum – 2.5 litres minimum of engine oil
Škoda 120 LS	4.6 litres maximum – 3 litres minimum of engine oil
Gearbox and final drive case	2.5 litres of gear oil (2 litres when changing oil)
Steering box	0.16 litres of gear oil (about 0.25 litres when topping up)
Brake system and clutch	0.48 litres of brake fluid (filling for tropical regions, etc. see Chapter 16.2)
Cooling system	12.5 litres of antifreeze
Fuel tank	38 litres

1.8 TIGHTENING TORQUES OF NUTS AND BOLTS

1. Applicable to phosphate-coated and galvanized nuts and bolts, and to such parts without a surface finish.
2. It is irrelevant whether the tightened connection is lubricated with oil or not lubricated at all. When using another lubricant, other torque values have to be determined for their tightening.
3. In the case of cadmium-plated bolts and nuts (with a lower coefficient of friction), the torque has to be reduced by about 30 per cent.

General data for various materials of bolts and nuts

Thread	Maximum tightening torque Nm[1])				
	Material				
	5 D	6 S	8 G	10 K	12 K
M 6	4.3	7.3	9.7	13.5	16.5
M 8	10	17.5	23.5	33	39.5
M 10	20.5	35.5	47.5	67	80.5
M 8×1	10	17.5	23	32.5	39
M 10×1.25	20.5	35	47	66	79.5
M 12×1.5	35.5	61	81	114	137
M 14×1.5	56	96	128	180	216
M 16×1.5	87	149	199	281	338

ENGINE Connection	Dimensions	Tightening torque Nm[1])
Nut of crankshaft bearing bolt	M 10	40 — 45
Nut of connecting rod bolt	M 8×1	25 — 28
Nut of water pump belt pulley	M 8	12 — 16
Nut of fuel pump	M 8	12 — 16
Nut of cylinder head cover bolt	M 6	4 — 6
Nut of silentblock bolt	M 8	25 — 32
Nut of cylinder head bolt	M 8	25 — 28
Cylinder head bolts	M 10	50 — 55
Bolt of camshaft gear	M 10	30 — 35
Flywheel bolt	M 10×1	55 — 65
Bolt of crankshaft belt pulley	M 20×1.5	100 — 120
Oil sump bolt	M 6	7 — 9
Oil sump screw		
Drain plug	M 22×1.5	30 — 35
Bolt of fuel pump packing piece	M 8	8 — 10
Bolt of oil pressure relief valve	M 14×1.5	22 — 25
Socket of oil pressure switch	M 16×1.5	50 — 55
Oil pressure switch	M 10×1	20 — 25
Sparking plug	M 14×1.25	20 — 30

CLUTCH Connection	Dimensions	Tightening torque Nm[1])
Bolt fastening clutch housing in flywheel	M 8	23 — 28

GEARBOX - FINAL DRIVE

Connection	Dimensions	Tightening torque Nm[1])
Nuts of casing clamping bolts	M 8	22 — 25
Nut of primary shaft	M 22×1.5	35 — 45
Pinion nut	M 24×1.5	40 — 50
Nut of pinion bearing cap	M 8	14 — 17
Nut of release sleeve bolt	M 6	6 — 8
Nut of front cover bolt	M 8	19 — 25
Nut of speedometer shaft clip bolt	M 6	7 — 9
Nut of speedometer drive bearing bolt	M 6	7 — 9
Nut of reverse-gear pin bolt	M 8	17 — 20
Bolt of reverse-gear pin	M 8	7 — 9
Bolt of shifter forks	M 6	14 — 17
Bolt of cap of lock-ball springs	M 6	7 — 9
Silentblock bolt	M 10	30 — 40
Bolt of differential case	M 8	20 — 30
Bolt of crown gear	M 10×1	70 — 80
Drain and inspection hole plugs	M 22×1.5	30 — 35
Switch or bolt of reversing lamps	M 14×1	7 — 9

REAR AXLE

Connection	Dimensions	Tightening torque Nm[1])
Road wheels nuts	M 12×1.5	60 — 70
Nut of axle-shaft ball joint bolt	M 8	20 — 25
Nut of axle shaft	M 18×1.5	170 *)
Bolt of brake backing plate	M 8	23
Bolt of wheel cylinder	M 10	40 — 50

FRONT AXLE

Connection	Dimension	Tightening torque Nm[1])
Nut fastening lower wishbone fulcrum bracket to bodywork	M 12×1.5	65 — 70
Nut of lower wishbone fulcrum bracket (next to rubber bush – inner)	M 12×1.5	45 — 60
Ditto – outer lock nut	M 12×1.5	70 — 90
Nut of upper wishbone fulcrum bracket (next to rubber bush – inner)	M 12×1.5	45 — 60
Ditto – outer lock nut	M 12×1.5	70 — 90
Nut of upper wishbone pin (connection with steering knuckle pivot)	M 12×1.5	70 *)
Nut of lower wishbone pin (connection with steering knuckle socket)	M 12×1.5	70 *)
Nut of wheel hub bearing	see Chapter 6.5, points 24 and 25	
Nut of steering knuckle pivot	see Chapter 6.5, point 21	
Nut of lower wishbone bracket bolt	M 10	40 — 50
Nut of bolt fastening shock absorber to its anchor bracket	M 12×1.5	50 — 55
Nut fastening shock absorber to bodywork	M 10	12 — 14
Wheel nuts	M 12×1.5	60 — 70
Bolt fastening front axle to bodywork	M 10	40 — 45
Bolt of anti-roll bar bracket	M 7	12 — 16

*) Further tightening as required for aligning holes for the cotter pin.

Connection	Dimensions	Tightening torque Nm[1])
Bolt of upper wishbone bracket	M 8	19 — 25
Bolt of shock absorber anchor bracket	M 8	20 — 25
Brake disk bolt	M 10×1	48 — 60
Bolt to disk brake stirrup	M 12×1	70 — 95
Bolt to brake stirrup bracket	M 8	19 — 25

STEERING

Connection	Dimensions	Tightening torque Nm[1])
Steering wheel nut	M 14×1.5	25 — 30
Rocker shaft nut	M 18×1.5	10 *)
Nut of slave arm spindle	M 14×1.5	60 *)
Nut of slave arm spindle	M 10	40 *)
Nut of ball pin	M 10×1	40 *)
Drop arm nut	M 12×1.5	70 *)
Steering rod nut	M 12×1.5	50 — 60
Nut of steering rod ball-pin socket	M 26×1	50 — 60
Nut of rocker shaft play adjusting screw	M 12×1.5	25 — 30
Nut of steering wheel shaft joint	M 8	25 — 30
Bolt to cap of steering box bearings	M 6	7
Bolt to steering box cover	M 7	15 — 17
Steering box fastening bolt	M 10	45 — 50

POWER PACK

Connection	Dimensions	Tightening torque Nm[1])
Nut of starter motor bolt	M 10	30 — 40
Nut to radius arm bolt	M 14×1.5	60 — 70
Ditto	M 12×1.5	50 — 60
Nut to silencer bracket bolt	M 8	20 — 23
Nut to silentblock (between gearbox and cross bearer)	M 10	18 — 22
Nut to shock absorber – lower	M 10	20
– upper	M 10	14
Nut to connecting bolt (engine to final drive case)	M 8	23
Ditto	M 10	40 — 50
Bolt of rear axle resilient mounting in bodywork (at top of spring)	M 8	20 — 23
Bolt of radius arm in bodywork bracket	M 10	24 — 32
Bolt connecting gearbox cross bearer to bodywork	M 10	20 — 30

*) Further tightening as required for aligning holes for the cotter pin.

1.9 PHYSICAL UNITS

The new SI international system of physical units (measuring units) has supplanted some of the units with new, hitherto unused ones. To facilitate orientation, we give a brief survey of the changes and relations of the new units to the old ones in conformity with their use in the manual.

a) Dimensions in illustrations and diagrams indicated in figures only are in millimetres.

b) The unit of force (load) "N" (newton) replaces the former kp (kilopond) or kg (kilogram), and the relation of 1 kp or kg = 9.806 N (newtons) is applicable.

c) The unit of the moment of torsional force (torque) "Nm" (newtonmetre) replaces the former kpm of kgfm (kilopondmetre or kilogram-

metre), and the relation of 1 kpm = 9.806 Nm is applicable. When applied to tightening torques of bolts and nuts, use the relation 10 Nm = = 1 kpm.

d) The unit of power (output) "W" (watt) replaces the former "h. p." (horsepower) and the relation of 1 h. p. = 735.499 W is applicable. For practical purposes, a multiple of kW (kilowatt = 1,000 watts) is used, i. e., 1 h. p. = = 0.736 kW.

e) The unit of pressure "Pa" (pascal) or, in practice, MPa (megapascal = 1,000,000 pascals) or kPa (kilopascal = 1,000 pascals) replaces the former "bar" and "kg/cm²", and the following relation is applicable: 1 MPa = 10 bars = 10.2 kg/cm² (kp/cm²). For current measuring of tyre pressure etc., use the relation: 100 kPa = 1 bar = = 1 kg/cm² (kp/cm²) = 1 atm.

1.10 GENERAL INSTRUCTIONS

With the exception of a few special procedures or assembly techniques mentioned in the respective section of this manual, every removal and refitting (disassembly and reassembly) should be governed by the following general principles:

a) Use suitable tools and especially tubular box spanners which cause the least damage to nuts and bolt heads.

b) During disassembly note carefully how the parts have been assembled. This knowledge is invaluable for correct reassembly.

c) Clean parts in trichloroethylene or technical petrol. They do not contain substances (especially lead) which harm the skin as motor petrol does. Current brands of sealing compounds can be removed with denaturated alcohol or scraped off. For a special sealing compound see the note at the end of this chapter.

Avoid contamination of self-lubricating metal bearings with any degreasing agent as this would unfavourably affect their self-lubricating properties.

Clean parts of the brake and clutch hydraulic system with alcohol.

d) Lubricate all parts moving on or in each other before their assembly. Operating lubricants do not spread easily on dry surfaces, the parts are not properly lubricated, and friction areas are apt to get damaged. Coat the assembled parts with the lubricant which is used to lubricate them in operation. When lubricated with oil, dip the parts in motor oil, the fluidity of which makes it especially suitable for this purpose. Use greases and hydraulic fluid brands specified in the Table of Recommended Lubricants.

e) Use new cotter pins and metal lock washers if you are not convinced of the perfect condition of the old ones which could break and leave the joints unsecured. Moreover, there is a risk of the broken parts damaging other functional parts.

f) Clean new antifriction bearings (ball, roller, and tapered roller bearings) of preserving grease using kerosene. Preserving grease is not suitable for lubrication and it mixes badly with lubricants.

g) Some of the joints have to be tightened with a maximum accuracy to the specified torques listed in the previous chapter.

h) The permissible rotation unbalance is specified for some of the rotating parts, usually in gcm (gramcentimetres). A well balanced part can be stopped in any position if it is installed so that no rotation resistance acts on it. With the exception of dynamic balancing, the parts are usually tested on an auxiliary shaft placed on the edges. The unbalanced part moves from the deflected position with its heaviest (i. e. unbalanced) part downward. The value of unbalance can be determined when fastening a weight corresponding to the permissible unbalance to the opposite side of the unbalanced part. If the part does not move when deflected or if it moves with this weight downward, the unbalance is within the recommended limits. The weight of the testing weight shall be determined by dividing the value of the permissible unbalance by the distance of the weight from the rotation centre of the part.

i) Even slightly damaged seals and packings must be replaced with new ones .

Note:

In the factory, the special sealing compound of the "Velvanton C" brand is used for sealing the engine rear cover on the cylinder block, the mating surfaces of the gearbox housing halves, and the guide of the clutch release bearing.

This sealing compound is made on the base of a polyurethane plastic and it corresponds to "Hykemar", "Reineplast", "Curil K" and similar compounds. It can be removed from the parts by scraping and washing with acetone, butylacetone or chlorinated solvents, for example chloroform (trichloromethane) and carbon tetrachloride.

2 - ENGINE

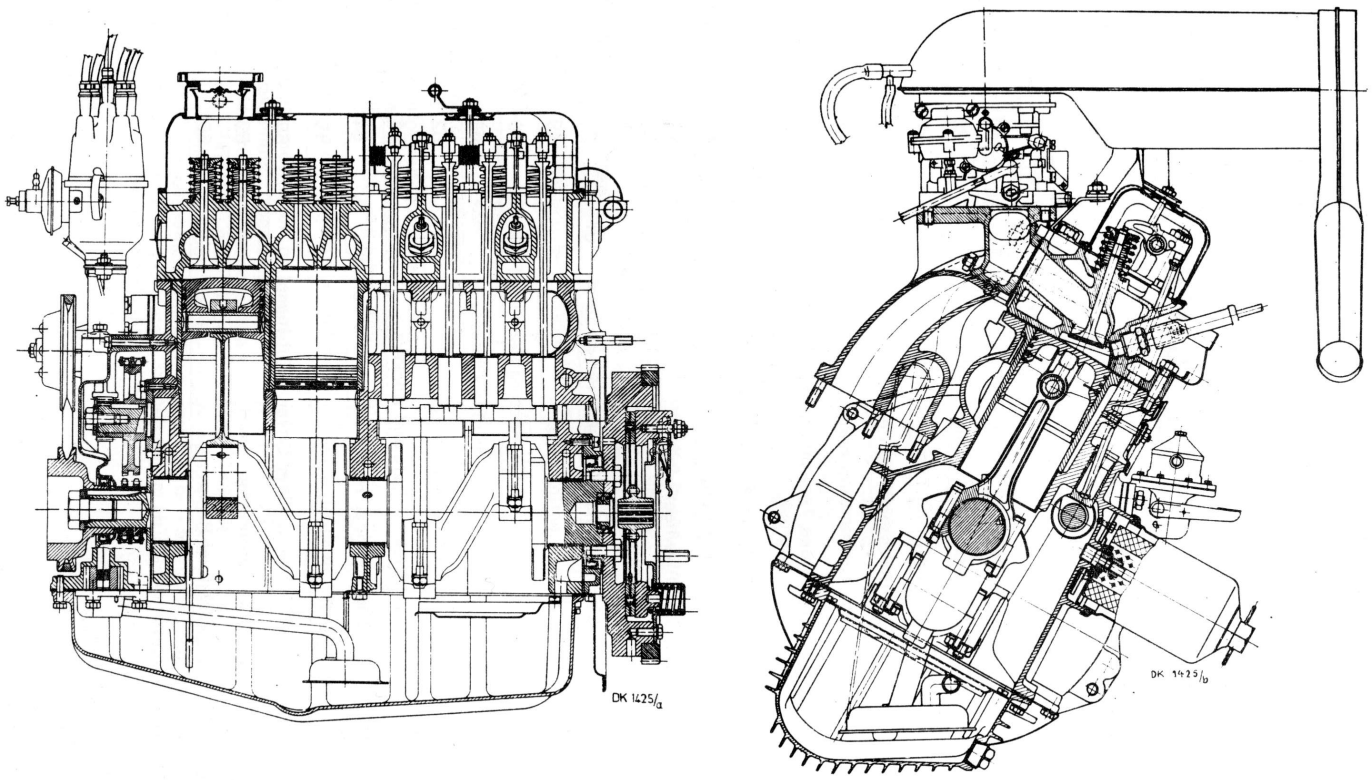
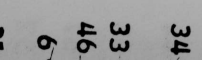
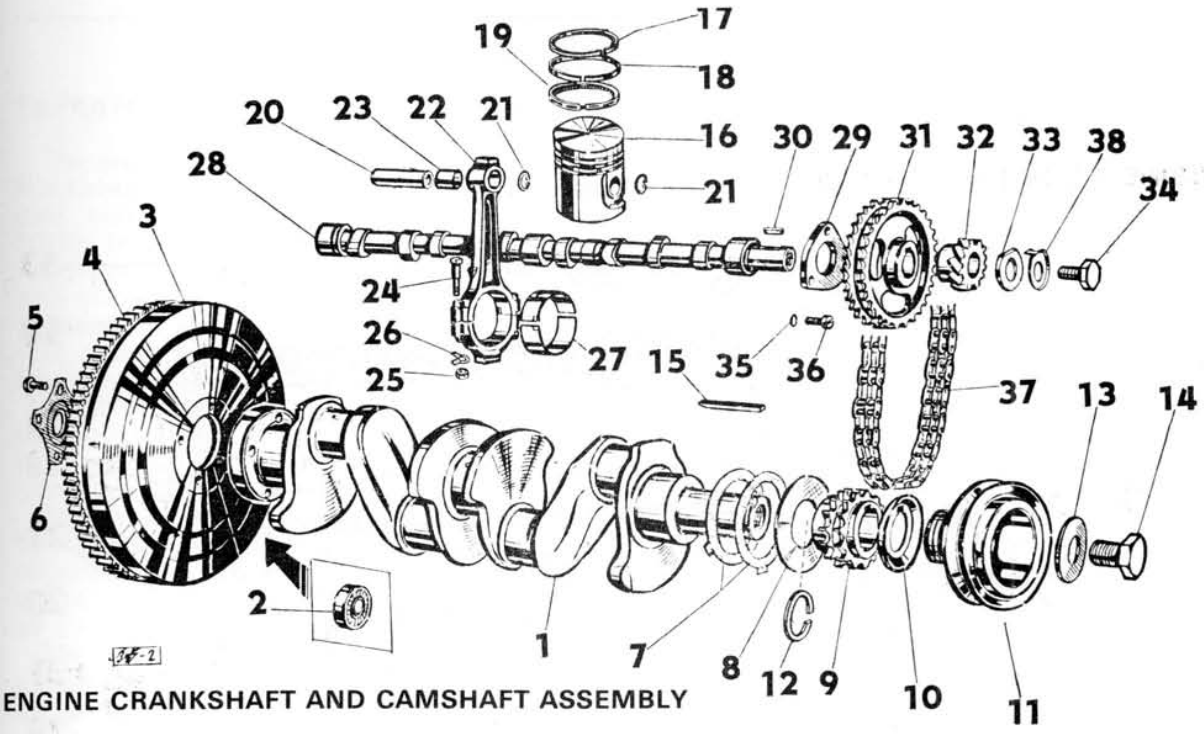
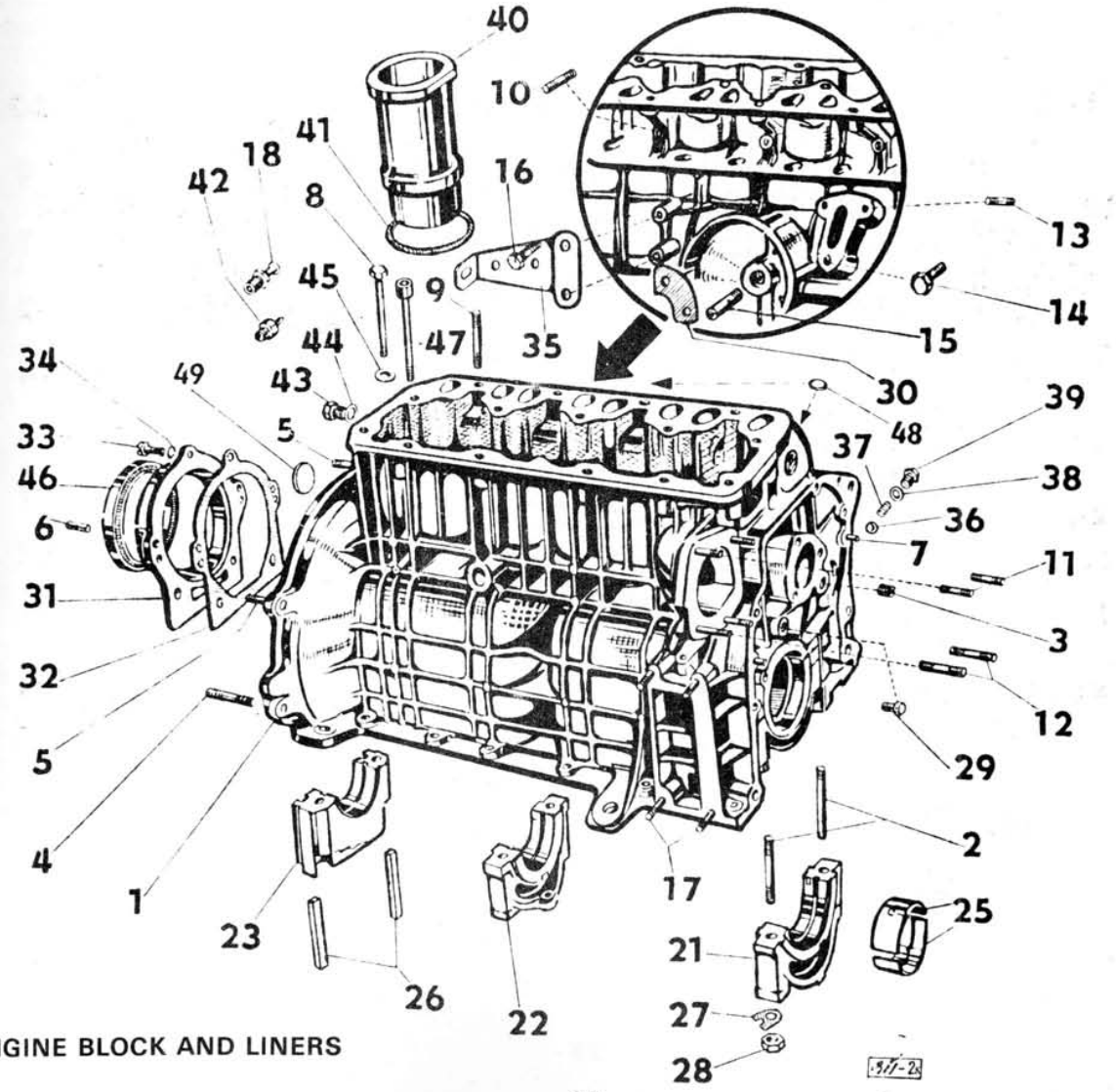


Fig. 2/1 - Sectional View of Engine with Clutch



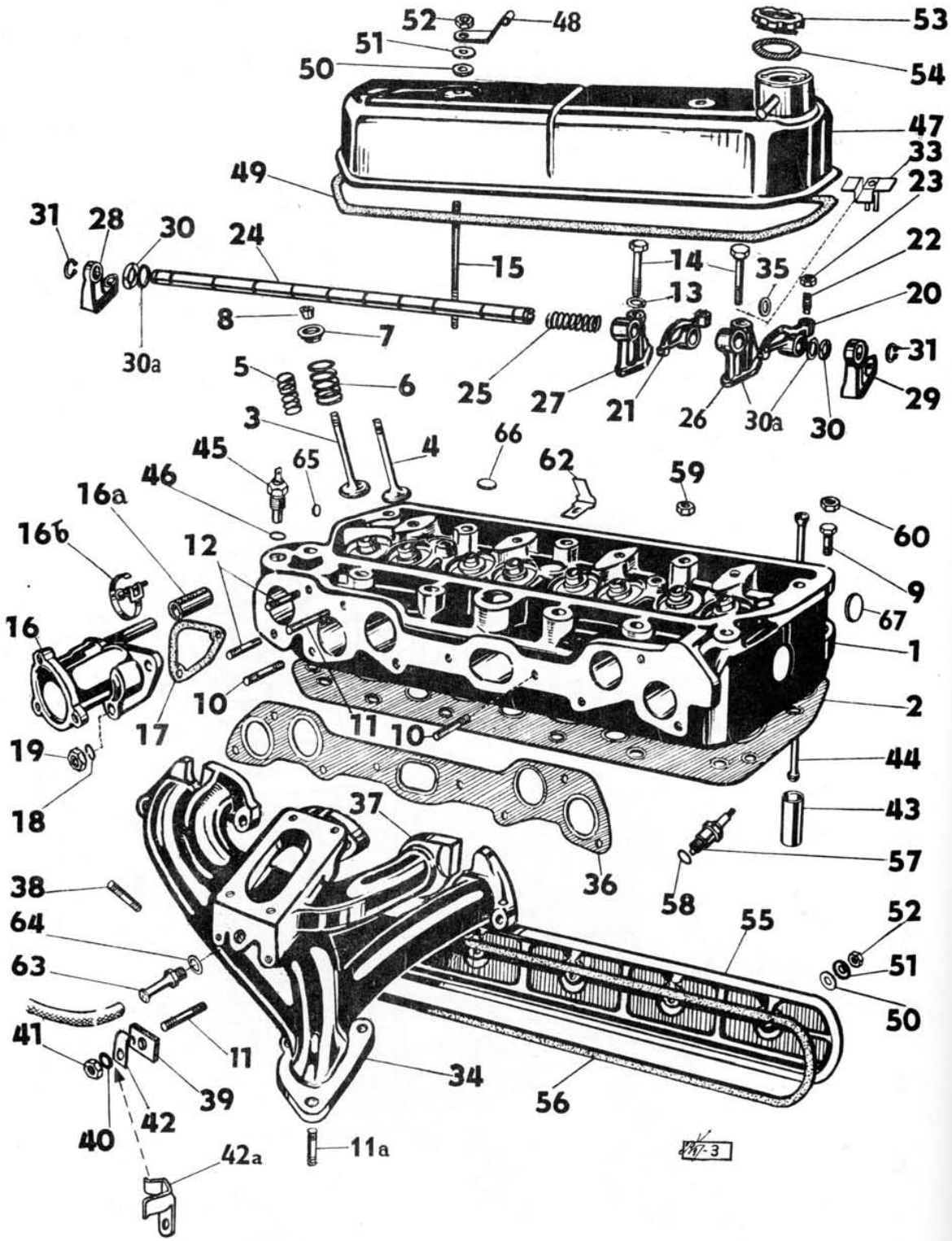


ENGINE CRANKSHAFT AND CAMSHAFT ASSEMBLY



ENGINE BLOCK AND LINERS

ENGINE CYLINDER HEAD ASSEMBLY



Technical Description

The engine is a water (antifreeze) cooled four-stroke four-cylinder in-line unit. The valve gear with valves in overhead arrangement (OHV) incorporates a chain-driven camshaft.

The crankshaft is supported in three bearings with thin-wall shells. Thin-wall shells are also provided on the shaft for the connecting rod with a bronze big-end bush. Separate cylinder liners are fitted in the cylinder block.

The force-feed lubrication circuit incorporates a by-pass oil filter and, depending on the engine type, also an oil cooler. An automatic pressure relief valve controls the oil pressure.

Circulation of the coolant is forced, actuated by the water pump. The JIKOV type two-stage downdraught carburettor has a mechanically controlled choke (rich-mixture device). The dry air cleaner has a paper filter element.

The fuel pump of the diaphragm type incorporates a fuel filter and is driven by an eccentric provided on the camshaft.

The ignition order of the battery (coil) ignition system is 1 - 3 - 4 - 2 (the figures 1 to 4 of the direct sequence are cast on the cylinder head beside the sparking plug holes).

The distributor incorporates a vaccuum unit and a centrifugal timing control. Power is supplied by an alternator (a.c. generator) for a nominal voltage of 12 volts.

Deaeration of the crankcase forms a closed circuit with the intake over the carburettor.

The engine is right-handed when viewed from the belt pulley (timing gear) side. The counting of cylinders begins from this side from the first to the fourth cylinder toward the flywheel (in the forward direction in the car).

2.1 REMOVING ENGINE FROM CAR

a) Preparatory measures and jobs to be done in the engine compartment

1. Drain the coolant (antifreeze) from the cooling system into a clean vessel - see Chapter 15.13.

Put jacks under the sills next to the rear doors and chock the front wheels, if necessary. Jack up the car so high that the engine can be withdrawn from under the body in the backward direction.

Disconnect the battery earthing wire from under the left-hand cover in the floor board behind the rear seat backrests.

2. Lift away the air cleaner and disconnect the accelerator (throttle) link from the piping and the carburettor. For this purpose, hold the throttle link connecting the bracket on the piping with the carburettor in pliers and push the clip on to the narrowed-down part of the link.

Caution! When working in the engine compartment (bay) do not disturb the connectors of the licence number light - do not lean against them, etc. According to circumstances, pull off the cables or pull out the holders with the bulbs from the lamp, and/or make an auxiliary cover and fit it on the upper surface of the tail-end panel.

3. Separate all connections connecting the engine with the electrical equipment and the cooling system. Disconnect the fuel feed line and all the remaining connected systems.

4. Drain engine oil if necessary (depends on the purpose of engine removal).

5. Remove the bolts of the right-hand engine cowling, lift away the cowling, and remove the bolts fastening the left-hand cowling to the engine cross bearer. To remove the engine including the oil cooler, detach it from its bracket, disconnect the hoses from the cooler, and drain the oil from the hoses and the cooler.

b) Work to be done inside the car

6. After removing the centre cover in the floor board behind the backrests of the rear seats, screw off the nuts of the flanged connection of the engine with the gearbox.

c) Work to be done from under the car

7. Detach the gear change link from the gearbox - see Chapter 4.1, paragraph 9.

8. Detach the flywheel guard from the gearbox flange and screw off the remaining two nuts of the engine gearbox flanged connection. Support the gearbox with a jack and remove the bolts of the engine bulkhead (on the body).

9. Lower the jacks under the gearbox and the engine and let the engine drop so far that the bulkhead cannot foul the body when moving the engine rearwards. Check the gearbox housing for correct seating on the jack and by backing the rolling jack remove the engine from the car. To completely disconnect the engine from the gearbox housing, it is necessary to move it out 70 mm.

Hold the engine on the rolling jack to prevent it from falling.

2.2 REFITTING ENGINE IN POSITION

To refit the engine in position reverse the procedure of its removal, i.e. proceed backward from paragraph 9 to 1 of the preceding chapter.

Fitting the engine to the gearbox housing flange requires, however, greater care than its removal. Insert the stud bolts of the engine flange carefully into the gearbox flange holes so as not to bend the studs or damage their

threads. Fill the engine with oil and the cooling system with an antifreeze, and bleed them.

2.3 REASSEMBLING THE ENGINE

The reassembly procedure depends on the extent to which the engine has been dismantled. For better understanding, a reassembly of a completely dismantled engine is described in the following paragraphs.

Inspection of Cylinder Block

1. Clamp the thoroughly cleaned cylinder block into the MP 9-101 stand with the engine carrier type MP 1-101 and check it for completeness – see Chapter 2.6. Fit the block with its lugs on the engine carrier pins and use the side bolt for holding it down.

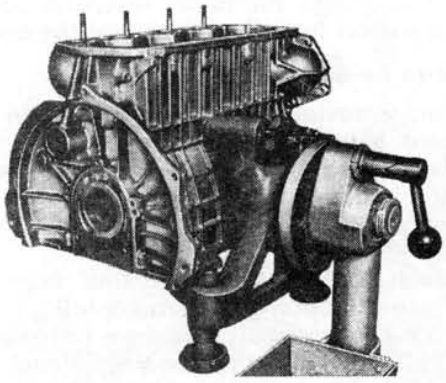


Fig. 2.3/1 - Cylinder Block Fastened on the Assembly Stand by Means of the MP 1-101 Carrier

2. Remove the pressure relief valve, make sure that the ball contact faces are clean, and refit the cleaned valve. For fitting a new valve see Chapter 2.6.

3. Remove the crankshaft bearing covers and the cylinder block rear cover.

To Refit the Crankshaft

4. Force the bearing shell halves with the fingers into the crankshaft bearing bores so that the shell lip snaps home into the slot (cut-out) in the block and so that the shells do not protrude over the bearing surfaces for the bearing covers, and lubricate them with engine oil. Be sure to fit shells matching the crankshaft journals – see Chapter 2.7.

5. Slip the oiled guide ring on the crankshaft with oil grooves pointing toward the crankshaft web and fit the crankshaft with the pressed-on ball bearing (see Chapter 2.7) into the shell.

6. Insert the bearing shell half into the cover of the bearing No. 1 as described in paragraph 4, and fit the cover with the recess for the guide ring turned outward. Proceeding from the front of the block, slip on the next guide ring with the oil grooves pointing away from the block so that its lip engages again into the slot in the cover. Coat the ring with oil and slip on the thrust ring. Fit the MP 1-112 thrust collar on the crankshaft and tighten the bearing slightly using the belt pulley bolt.

7. Install the next two bearing covers complete with bearing shells and lightly tighten the cover nuts. Press the cork seal into the rear cover making sure that it fits the groove snugly and slightly overlaps the lower seating surface. Before fitting the cork seals, compress them for a while in a vice to distort them. Insert the distorted seals in the grooves or gaps between the cover and the cylinder block where they will expand and provide for perfect sealing.

Insert tab washers under the nuts of the bearing covers and while tightening the nuts check their correct position so as to enable a subsequent correct locking of the nuts.

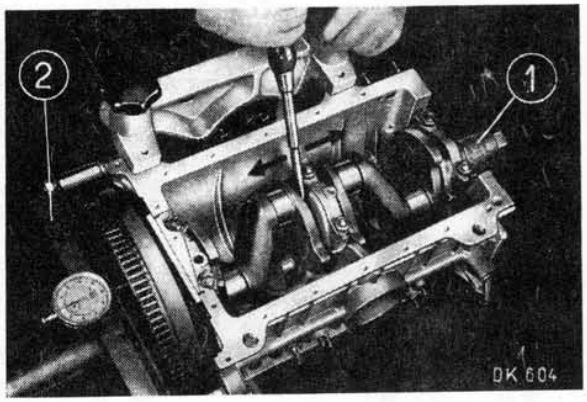


Fig. 2.3/2 - Measuring Crankshaft Play

1 - Thrust collar, type MP 1-112
2 - Dial indicator in a specially made yoke

8. Rotate the crankshaft several times and using a mallet tap the covers and both shaft ends to ensure a correct bedding of the covers and crankshaft guide rings.

9. Tighten the belt pulley nut to clamp the thrust ring, and rotate and force off the crankshaft to check its play. The crankshaft must be free to rotate but without any noticeable play. If there is a noticeable play, recheck its value and adjust it by replacing the guide ring with a new one. The maximum play should not exceed 0.10 mm, the recommended minimum play being 0.04 mm.

10. Fit the reassembled rear cover with the special seal ring after having oiled the shaft end and the ring.

Drive the sealing ring home into the cover in such a position in which its sealing edge will be turned toward the engine when refitting the cover. Use a gasket for sealing the cover. However, the procedure to be preferred is to coat the cylinder block mating surface with the special sealing compound mentioned in the note in Chapter 1.10.

11. Tighten the nuts of the centre cover (for the tightening torque see Chapter 1.3). Proceed in the same manner with the remaining two covers. Rotate the crankshaft each time after having tightened a cover to make sure that it does not stick in any of the bearings. The shaft must rotate freely with a uniform resistance. Then lock the nuts by bending the tabs of the washers over the edges of the bearing covers and nuts.

To Refit the Flywheel

12. Repack the crankshaft bearing with grease if necessary, and locate the flywheel on it with its pressed-on gear ring. When refitting a flywheel which has been removed from the engine, heed the marks indicating its position with regard to the engine. Insert tab washers under the bolt heads, tighten the bolts (see Chapter 1.3), and lock them in position by bending the tabs of the washers. Secure the shaft against rotating by using the MP 1-111 pawl installed on the cylinder block flange bolt. For flywheel marking see Chapter 2.8.

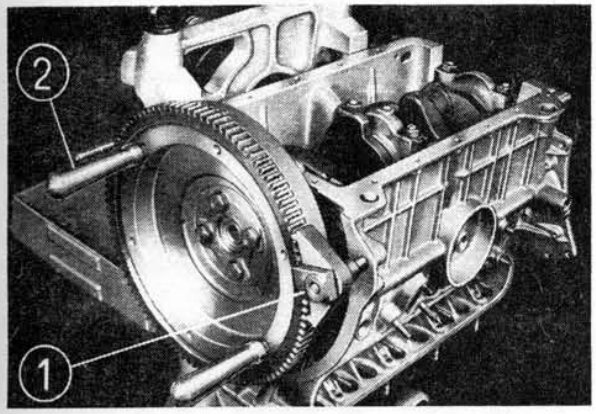


Fig. 2.3/3 - Securing Flywheel against Rotating Using the Pawl (1) and the Auxiliary Handles for Crankshaft Rotating (2)

Screw auxiliary handles into the clutch bolt holes, for example according to Fig. 2.3/3. They can be used for rotating the crankshaft during further operations while preventing chafing of the hands by the cylinder block stud bolts.

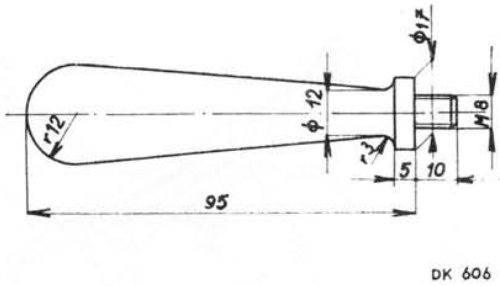


Fig. 2.3/4 - Auxiliary Handle

To Refit Cylinder Liners, Pistons and Connecting Rods

13. Before inserting cylinder liners by thumb pressure into the cylinder block, inspect all contact surfaces for clean condition.

Proceed in accordance with Chapter 2.12 or in the sequence of their previous removal. The liners have to project above the top face of the block (see Fig. 2.3/6).

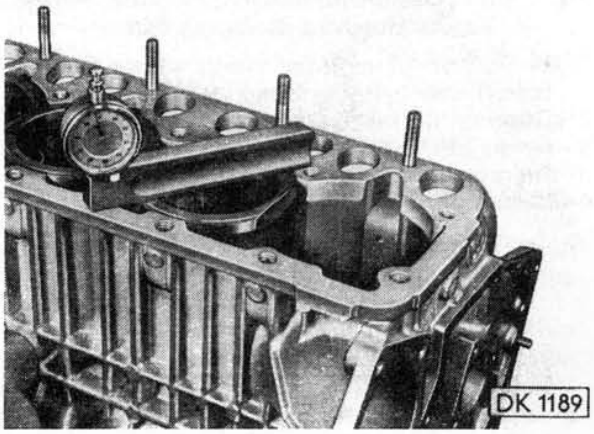


Fig. 2.3/5 - Measuring Cylinder Liner Projection

Check the protrusion using a dial indicator and correct any differences by inserting shims of suitable dimensions under the cylinder liner flange and then recheck, using again the MP 1-107 dial indicator (Fig. 2.3/5) or the MP 1-158 feeler gauge.

Before measuring the cylinder liner protrusion, tap the liner home using a wooden pad. Shims are available in sizes from 0.1 to 0.14 mm.

Insert and embed the cylinder liners in succession, one after the other. After the final check, remove them together with the shims, arrange them in their correct order, and mark them with chalk or a pencil with figures 1 to 4 on their outer cylindrical surface on the side of the camshaft bore. Smear the shims and the lower side of the cylinder liner flanges with grease which will prevent the shims from falling off when reinserting the liners.

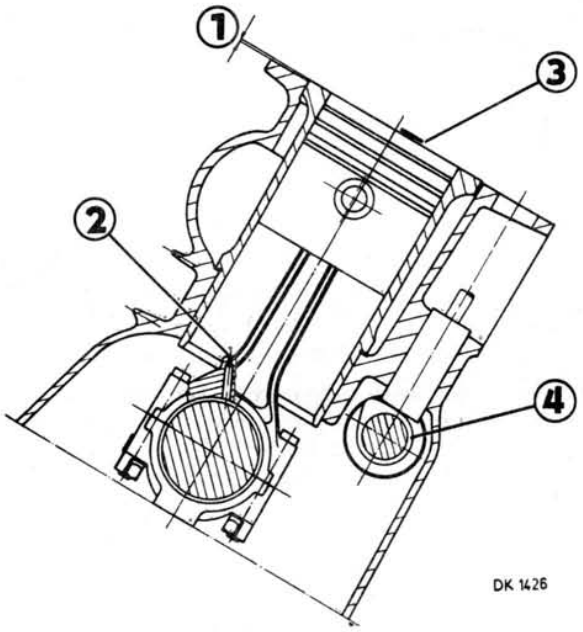


Fig. 2.3/6 - Position of Cylinder Liners, Pistons and Connecting Rods in Engine

1 - Projection of cylinder liners above the top face of the cylinder block (0.125 - 0.155 mm)
2 - Connecting rod splash hole
3 - Arrow on the piston head pointing toward the camshaft
4 - Camshaft

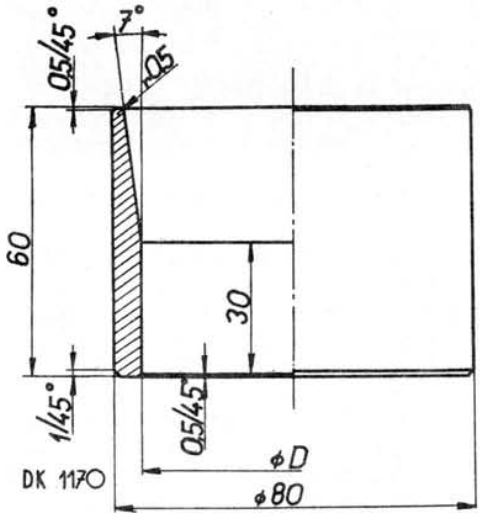


Fig. 2.3/7 - Pilot Ring for Piston Rings

Dimensions of pilot ring to match cylinder liner diameter:

dia. 68	D = 68 H7
dia. 68.25	D = 68.25 H7
dia. 68.50	D = 68.50 H7
dia. 72	D = 72 H7

14. Having fitted the piston rings and connecting rods on the pistons, turn the piston ring gaps so that they are staggered through 120°. Coat the entire surface of the piston with the fitted rings with oil and insert the pistons assembled with the connecting rods into the liners in the sequence of the corresponding numbers of cylinders and connecting rods. Make sure that the arrow in the piston head points toward the marking of the cylinder liners, i. e. toward the camshaft, after the assembly with the cylinder block. This is important in that it does away with additional turning of the pistons in the liner and a possible displacement of the piston ring gaps.

Smear the top surface of the cylinder block with paint or a sealing compound before installing the liners with the pistons and connecting rods into the cylinders in the order of their numbering.

It is advisable to prepare a sheet sleeve or a pilot ring according to Fig. 2.3/7 to compress the piston rings when fitting the piston into the cylinder liners. Force the piston into the sleeve or pilot ring so that the piston head is flush with its edge or protrudes slightly over it, locate the piston on the liner, and then force down the piston through the sleeve or pilot ring into the liner.

15. Place suitable auxiliary devices over two holes for cylinder head bolts, for example large-diameter washers, and screw them down

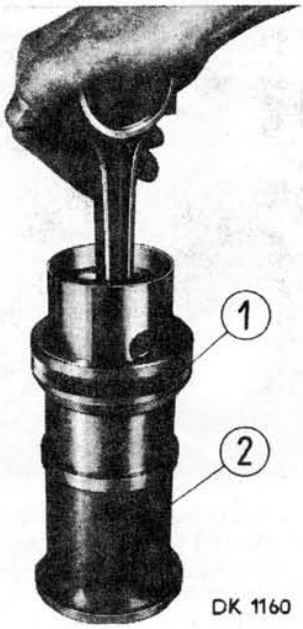


Fig. 2.3/8 - Fitting Piston into Cylinder Liner Using the Pilot Ring

1 - pilot ring
2 - cylinder liner

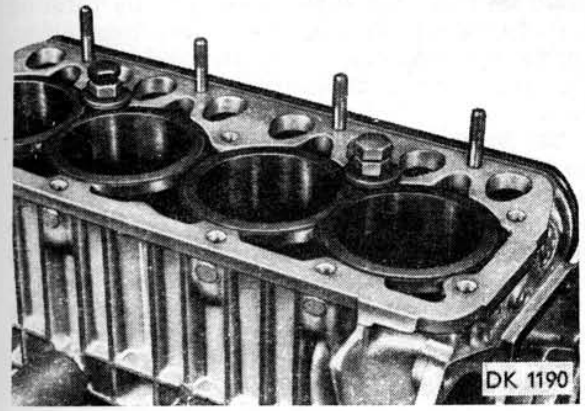


Fig. 2.3/9 - Locking Cylinder Liners in Position Using Bolts and Washers

using short bolts. Cylinder liners with pistons will be thus held down and secured against being pushed out during the next operations.

16. Smear the crankpins with oil, check the pistons for correct position with respect to the camshaft (see Fig. 2.3/6), and assemble the connecting rods complete with the big end bushings and covers with the crankshaft. Tighten the nuts with a torque as per Chapter 1.8. Tap the covers home with a mallet and rotate the crankshaft several times to check the entire crank mechanism for free rotation. Check visually the axial clearance (play) of the big end on the crankshaft. If the nuts cannot be tightened by the specified torque, lock them in position with washers, Ordering No. 101-019670.

17. Swing over the block with the cylinders on top, coat the mating surfaces of the pump and the block sparingly with grease, locate the pump gasket, and fasten the assembled water pump by thoroughly tightening the nuts (see Chapter 2.14). Do not forget to insert spring washers under the nuts.

18. Install the thrust plate on the camshaft provided with a plug in the bore of the rear bearing front face, tap home the timing gear with the punch mark in the tooth gap outwards from the shaft and the worm gear with the longer end of the hub toward the timing gear, locate the plain and the lock washer, and clamp the gears with the tie-bolt (see Chapter 1.8). The thrust plate must rotate freely on the camshaft. Blow through the oil holes with compressed air.

To Install Timing Gears, Chain and Camshaft

19. Turn the crankshaft with the keyway for the belt pulley key upward and so that the pistons of the first and fourth cylinder are in their TDC positions (as far as the fitting of the pawl permits), fit the MP 1-111 flywheel pawl, and tighten the nut. Thus the crankshaft will be locked in position and prevented from moving even in the axial direction. Now the thrust collar can be removed from the front end of the crankshaft.

Insert the camshaft with oiled cams and journals into the engine and slip the timing gear with the punch mark turned outward on the crankshaft. Using a rule and feeler gauges check the timing gear flanks for alignment. If the gear on the crankshaft is somewhat low, adjust its position using the respective washers preferably so that the overhang has a maximum value of 0.1 mm. Adjusting washers 0.16 mm thick are available for this purpose.

During measuring, keep the engine turned with the timing gear upward.

20. Turn the engine into the horizontal position, remove the crankshaft timing gear, and pull out the camshaft so that its timing gear is in front of the crankshaft end.

Put the timing chain on the camshaft gear and fit the crankshaft timing gear into the chain with its punch mark turned outward. Count and set the chain pintles between the marks on the timing gears as per Chapter 12.13. Then push the camshaft back into the engine without changing the position of the chain and timing gears. Before pushing the camshaft completely home, slip the timing gear on the crankshaft.

After having correctly tensioned the chain, lock the tie-bolt of the gears on the camshaft by bending the washer. For the correct position of the timing chain and its tensioning see Chapter 2.13.

21. Recheck the position of the timing chain and gears in keeping with the marks, tap home the key into the crankshaft keyway, and bolt down the camshaft thrust plate. Insert spring washers under the bolts. Insert the key with its bevelled side downward (into the crankshaft) and fit the oil slinger ring on the shaft.

22. Put the distributor with its cap removed into the timing gear cover with the plugged oilway and installed pump and distributor bracket (see Chapter 12.18). Before inserting the distributor, coat its coupling sparingly with oil. The coupling notches are not aligned with the shaft so that it is necessary to rotate the shaft until the notches coincide and the distributor can be pushed home. Fasten the arm of the advance device with a bolt, nut, and spring washer to the distributor bracket arm and loosen the tie-bolt of the advance device arm so as to be able to rotate the distributor. Smear the cap sealing ring with oil.

To Fit Timing Gear Cover and Distributor

23. Locate the timing gear cover on the locating pins of the cylinder block and rotate the distributor until the screw (terminal) of the

primary feed to the distributor coincides with the connecting line of the distributor centre line and the first cylinder head bolt as per Fig. 2.3/10. Secure the distributor in this position by lightly tightenning the tie-bolt and remove the timing gear cover from the cylinder block. The used type of distributor is described in Chapter 13.5.

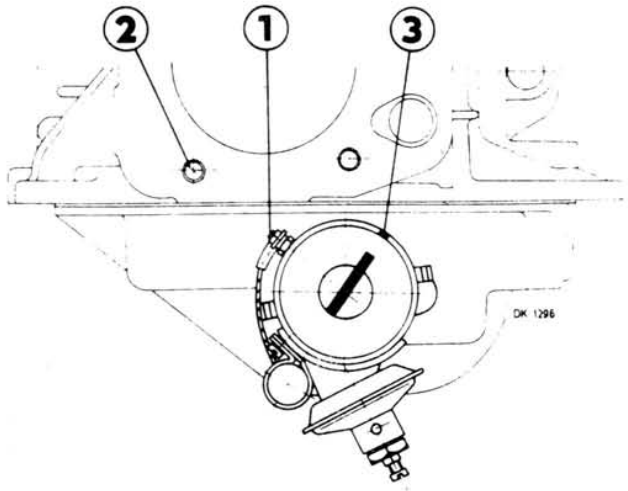


Fig. 2.3/10 - Position of Distributor on Engine

1 - screw of primary power feed
2 - cylinder head bolt
3 - index line marking the position of the distributor arm when cylinder No. 1 fires

24. Coat with oil the mating surfaces of the timing gear cover and the cylinder block, locate the cover gasket on the block, oil the timing chain and the camshaft worm gear. Remove the flywheel pawl and rotate the crankshaft through 360° so as to bring the pistons of the cylinders No. 1 and 4 to their TDC position again. This position corresponds approximately to the valve gear position when the cylinder No. 1 fires (the tips of the cams of cylinder No. 1 are turned downward, away from the engine). Lock the crankshaft in position by refitting and tightening the flywheel pawl.

25. Turn the distributor arm in the direction of the screw (1) in accordance with Fig. 2.3/10, hold it down with the finger in this position, and refit the timing gear cover on the cylinder block. By sliding the worm gear of the distributor drive into the camshaft worm gear, the arm is turned to coincide with the timing mark for cylinder No. 1 on the distributor housing. If there is no coincidence of the arm and timing mark, adjust the position of the arm by slightly rotating the distributor.

If the misalignment of the distributor arm and the timing mark of the cylinder No. 1 is so great that it cannot be corrected by rotating the distributor, remove the timing gear cover, rotate the distributor slightly and repeat the entire procedure of refitting the timing gear cover.

26. Smear the protruding end of the crankshaft and the outer shaft end (stem) of the belt pulley with oil, fit the belt pulley, the respective washer, and tighten the bolt. Bolt the pump suction strainer to the crankshaft centre bearing and use a spring washer under the bolt head.

27. Bolt down the timing gear cover using spring washers and cheese-head bolts (exclusively) and finally fasten the timing gear cover in such a position that the contact breaker points open before the crankshaft with the connecting rod and piston has attained the top dead centre (TDC) position (see the Ignition Timing Table in Chapter 15.3).

For checking the ignition advance, an electric power supply is required with a bulb connected in a circuit with the distributor, this circuit being interrupted by the action of the contact breaker.

An adapted conventional torch with a metal jacket can be used with advantage for this purpose.

Remove the flywheel pawl and set the required ignition advance by turning the crankshaft with a screwdriver inserted into the gear ring and propped against the cylinder block flange. Rotate the shaft anticlockwise a bit more than necessary and back it off so as to adjust the backlash of the timing gears and the distributor drive gears.

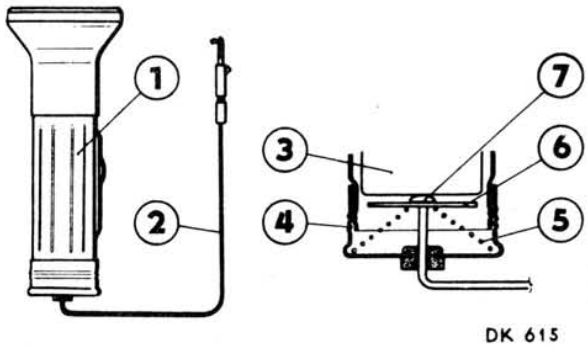


Fig. 2.3/11 - Lamp for Checking the Opening of Contact Breaker Points

1 - torch complete with dry cell and bulb
2 - lead with alligator clamp
3 - battery cell
4 - torch cap
5 - contact spring
6 - insulating plate
7 - electrical-contact connection of the lead with the dry cell

Connect the torch to the distributor terminal using the alligator clamp and switch on the torch. Rotate the distributor clockwise until the bulb starts glowing, and then back it off slowly. The point where the light goes out indicates the correct position of the distributor. A correct adjustment of the breaker point gap is naturally essential for the correct ignition timing.

28. Locate the cork seal of the rear crankshaft bearing and cut off protruding parts of the seal. Then fit the gasket and bolt down the oil sump while using spring washers. Before bolting the oil sump to a new cylinder block, drip oil into the threaded holes of the cylinder block. For the type of oil sump and its matching gasket see Chapter 2.17. If the cork seal is too dry it shrinks with the result of reducing the spacing of the bolt holes. In such a case put it in hot water for a short time. Check its size and remove it from the water before it swells excessively.

To Fit Cylinder Heads, Pipelines, and Valve Tappets

29. Turn the cylinder block back again and remove the jig locking the cylinder liners in position. Locate the cylinder head gasket, make sure that it does not obstruct the oilway in the cylinder block rear part, install the assembled cylinder head, and lightly tighten the bolts and nuts. Fasten the alternator brace bracket to the first bolt on the head bottom flange and the water pipe holder to the third bolt. Install the air cleaner bracket under two top bolts. For final tightening of the bolts etc. see Chapter 2.16.

Plain washers belong under the top cylinder head bolts with the exception of the two bolts which hold down the air cleaner bracket (the washers being replaced by this bracket), while no washers are required for the nuts of the head bottom flange. On engines with a 72 mm cylinder bore no washers are used for bolts of the outside rocker-arm shaft supports. The bolts have to be tightened only after the installation of the rocker-arm shaft, see paragraph 32.

Tighten the bolt of the alternator bracket brace over a spring washer.

30. Screw the primary element of the telethermometer with its appertaining sealing ring into the cylinder head and bolt down the casing of the thermostatic temperature control after having smeared its gasket with grease. Use spring washers under the nuts. Put the thermostat into the casing, locate the grease coated gasket, and fit the cover on the casing with the socket downward. Use spring washers with the bolts.

The thermostatic temperature control casing should be assembled with the respective pipe. If the pipe has been removed, refit it after having coated its thread with paint before tightening it in the socket. Install the thermostatic temperature control (see Chapter 11.5) with its vent hole on top and the end with the spring inside the case.

Locate first the exhaust and then the intake manifold gaskets on the cylinder head and tighten the nuts of both manifolds. Use shims when clamping together the flanges of both manifolds by means of their common tie-bolt. Place spring washers under the nuts of the centre branch of the exhaust manifold and plain washers under the nuts of the outside branches. Fasten the clip of the vacuum control pipe and the holder of the cold-starting suction pipe to the shim of the first top bolt of the manifold.

Supplement any missing stud bolts of the exhaust manifold for the further connected piping and of the intake piping for the carburettor. According to the car equipment, fit also the socket with packing for the connection of the vacuum hose for brake control.

31. Smear the guide surfaces of the valve tappets in the cylinder block with oil, insert the tappets and drip oil into them. Insert push rods into their respective holes in the cylinder head and also drip oil on their spherical top surfaces.

32. Install the rocker-arm shaft with supports and rocker arms. Insert the gasket under the support with the oilway. For details concerning the shaft see Chapter 2.15.

Put a shim under the bolt of the first support (second support on engine with 72 mm cylinder bore), i. e. at the first cylinder and parallel with the longitudinal centre line of the cylinder head, and plain washers under the bolts of the remaining three rocker-arm supports.

On engines with a 72 mm cylinder bore tighten the cylinder head bolts in accordance with paragraph 29.

33. Adjust the valve clearance with the aid of the rocker-arm ball pin, and use a feeler gauge to check its value. Lock the pin in position with the nut - see Chapter 2.13.

34. Cement the gasket on to the push-rod cover (to the edge of the bulging wall) and bolt down the cover. Insert seal rings and dished washers under the nuts so that the seal rings are clamped between the cover and the washers. Tighten the nuts carefully and sensitively just till the cover deflects slightly to prevent its permanent distortion.

For a too dry cork gasket see paragraph 28.

To Fit Fuel Pump, Oil Filter, and Carburettor

35. Install the insulating pad gasket, the insulating pad, the fuel pump gasket and the pump on the stud bolts in the cylinder block wall and tighten the nuts. Insert a plain washer under the head of the insulating pad bolt and

spring washers under the pump fastening nuts.

36. Install the oil filter - see Oil Filter in Chapter 15.3.

37. Bolt the bracket and the relay lever of the accelerator linkage to the intake manifold. Use spring washers to lock the bolts in position.

38. Locate the carburettor gasket, sheet guard, another gasket, the insulating washer, and a third gasket (altogether three gaskets of the same type) on the intake manifold inlet socket, install the carburettor, and tighten it down with nuts.

On 105 and 120 L engines, the sheet guard must be fitted to the intake manifold inlet socket with a throttling spider, while 120 LS engines must have the passage unobstructed.

39. Smear the ball pins of the linkage and carburettor lever with grease containing molybdenum disulphide and mount on them the accelerator link (tie-rod). Hold the link in pliers and slip securing clips over the heads.

Hook a spring on the shank of the relay linkage ball pin and on the rib of the forehousing on the carburettor.

40. Screw down the vacuum control pipe on the carburettor (using double-sided sealing rings) and slip on the rubber hose connecting the pipe with the distributor vacuum control unit. Secure the pipe by bending the clip under the nut of the intake and exhaust manifold.

To Refit Alternator

41. Attach the alternator bracket to the side of the cylinder block while putting plain washers under the nuts. Mount the alternator holder together with the engine mounting lug on the bolt of the timing gear cover and the front lug of the cylinder block. Use self-locking nuts for the bolts fastening the alternator holder. Lock the lower bolt of the lug by means of a spring washer and nut. Using another bolt, bolt together the lug and the bracket. Insert the tie-bolt from the side of the lug, slip on a plain washer and tighten the nut. Fit the short-circuit strip on the bolt and lock it in a position parallel with the alternator bracket by screwing down the respective nut with a plain washer.

42. Put the alternator into the holder, thread in the bolt, and screw down the nut with a plain washer without tightening. Without tightening the self-locking nut, bolt the strut into the bracket on the cylinder head. Swing the alternator toward the engine, fit the V-belt and, while tensioning it, connect the alternator with the strut using a bolt, spring washer and nut. At the same time, tighten the nut of the bolt holding down the alternator in the holder and the nut of the bolt connecting the strut with the holder. For the belt slack adjustment see Chapter 15.3.

43. Fasten the second engine mounting lug using nuts with spring washers.

To Fit Cylinder Head, Air Cleaner, and Sparking Plugs

44. Fit the cylinder head with cemented-on gasket on the cylinder block after having slipped a sealing ring and a washer on each bolt, the same as in the case of the push-rod cover. In addition, fit the fuel pipe holder on the rear bolt and hold it down by slightly tightening the nut.

45. Fit the air cleaner in position and fasten it to the carburettor with a bolt using a sealing ring and washer. Put a spring washer under the nut on the bracket and screw down the nut on the bolt of the cover without any washer.

46. Thread the fuel hose through its holder on the cylinder head and use clips to fasten it to the carburettor and pump. Adjust the most suitable position of the hose by rotating the holder and then tighten the nut.

47. Attach hoses connecting the air cleaner with the carburettor and the oil filler neck.

When preparing the car for driving in winter, install the winter air-intake tube (hose) - for detailed instructions see Chapter 15.3 "Air Cleaner - Winter Operation".

48. Screw in the sparking plugs with sealing rings and fit the ignition cables. For the recommended types of sparking plugs see Chapter 13.7.

The outlet on the distributor cap marked with a notch is intended for the cable to cylinder No. 1. The remaining outlets are to be counted clockwise and in direct order from 1 to 4 and the cables will be connected to sparking plugs in the order of numbers cast on the cylinder head beside the recesses for sparking plugs.

Plug Screws and Lubrication System Accessories

49. Plug the oil sump with the conical screw plug with its sealing ring. In the case of an engine without the oil cooler, plug the oilway on the timing gear cover with a screw plug with a sealing ring, and the oilway at the rear end of the cylinder block with a pressure switch. If the socket for screwing down the pressure switch is missing, install a new socket together with its respective sealing ring.

If an oil cooler is provided, hoses and a pressure switch should be connected to the oilways according to Chapter 11.9.

Put the oil dipstick with the fitted rubber ring in its place. For the type of the dipstick see Chapter 2.17.

50. Using spring washers with the bolts, screw down the flywheel guard after removing

the auxiliary handles from the flywheel. This is the final operation completing the engine assembly.

Final Operation Before Reinstalling Engine in Car or Before Brake Test

51. If a brake test is anticipated, fill the engine with oil, lubricate the distributor if necessary, and screw an oil pressure gauge in the place of the pressure switch.

If an oil cooler is fitted on the engine, plug the hose connections of the timing gear cover and the oilway of the cylinder block or interconnect them with a hose, or connect the oil cooler on the spot - see Chapter 11.9.

To Refit Exhaust Silencer and Cross Bearer (during reinstallation of the power unit)

52. Using bolts and plain and spring washers, fasten two clamps on to the exhaust silencer (for each bolted connection, two plain washers for the elliptical holes) with loosely screwed down nuts.

53. Place a gasket on the exhaust manifold, and fit and fasten the exhaust silencer using self-locking nuts on the side of the exhaust manifold, a bolt with a spring washer on the engine flange side, and a bolt, a collar, a spring washer, and a nut on the side of the gearbox flange.

Tighten the bolted connections of the exhaust silencer and the clamps.

54. Insert a silentblock into the lug in the direction from the engine and clamp it firmly by means of a second silentblock. Locate the cross bearer and fasten it using bolts with spring washers for its one end, and nuts with plain and spring washers for its other end with the cut-out. At the same time, fasten the short-circuit strip under the spring washer of the engine mounting and cross bearer bolted connection under the alternator. Scrape off paint from the contact surface.

2.4 DISMANTLING THE ENGINE

It is not our intention to describe in detail all dismantling operations as they are, as a rule, vastly routine jobs. We will, therefore, speak only of some specific features which deserve special attention.

1. Dismantle the engine using the same stand as for its assembly - see Chapter 2.3.

2. In view of the engine being dynamically balanced, it is necessary to mark the following items before proceeding with the engine dismantling:

a) the mutual positions of the clutch and flywheel - see Chapter 3.1;
b) the mutual positions of the flywheel and crankshaft - see Chapter 2.8;
c) the cylinders;
d) the valves;
f) the shells of the connecting rod big-end and crankshaft bearings (or to put them away in their respective order);
g) the valve tappets (or to put them away in their respective order).

This marking will enable you to refit the removed parts in their correct positions with respect to the parts to which they have been matched, and in their correct order.

Detailed information concerning the marking is contained in chapters dealing with the individual assemblies.

3. If a complete taking apart of the engine is not the purpose of the dismantling, always secure the crankshaft against moving backward as there is a danger of the inner guide ring (at the first crankshaft bearing) slipping off the crankshaft when pushing against the front shaft end during some of the dismantling operations. This slipping off of the ring entails inevitably the dismantling of the entire crank mechanism. For securing the crankshaft, use the MP 1-111 flywheel pawl or another jig if the flywheel has been already removed.

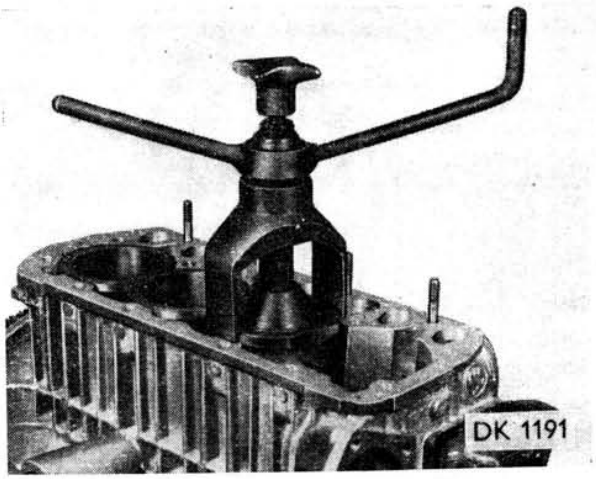


Fig. 2.4/1 - Extracting Cylinder Liners Using MP 1-105 Puller

4. Never remove the cylinder head if still hot. First loosen the nuts of bolts of the bottom flange and then remove the bolts on the cylinder head top surface - see Chapter 2.16.

5. Use the MP 1-105 puller for removing cylinder liners from the block. Turn the centre bolts of the jig to expand the jig jaws in the cylinder liner (at the top flange of the liner) and pull out the liner by turning the wrench.

6. Before removing the camshaft, lift away the valve tappets. If a removal of the cylinder head is not considered, release the ball pins of the rocker arms, lift away the push rods, remove the side cover of the push rods, and withdraw the valve tappets.

2.5 BRAKE TEST AND ENGINE LUBRICATION SYSTEM DIAGRAM

Brake Test

In view of the very specific character of the test, especially with regard to the special testing equipment, we do not intend to describe the test procedure, restricting ourselves to mentioning only the main values which the test is supposed to verify.

Values indicated in the diagrams are applicable to a new engine or an engine after a top overhaul, which has been correctly run-in by running for a period of about 50 hours (2,500 km travelled). If the engine is tested under other conditions, the measured values must approach the diagram values conformably with the mechanical condition of the engine.

In diagrams, peak performance values are indicated as measured in compliance with the ČSN (Czechoslovak State Standards) and DIN (Deutsche Ingenieur Normen), i.e. with all accessoires reducing the gross engine horsepower (water pump, alternator, air cleaner, exhaust silencer). The effective horsepower can vary with respect to the diagram values within a tolerance limit of minus 10 %.

Every engine after a top overhaul or replacement of individual parts of the crank mechanism has to be run-in exactly like a new engine. Do not forget to draw your customer's attention to this fact!

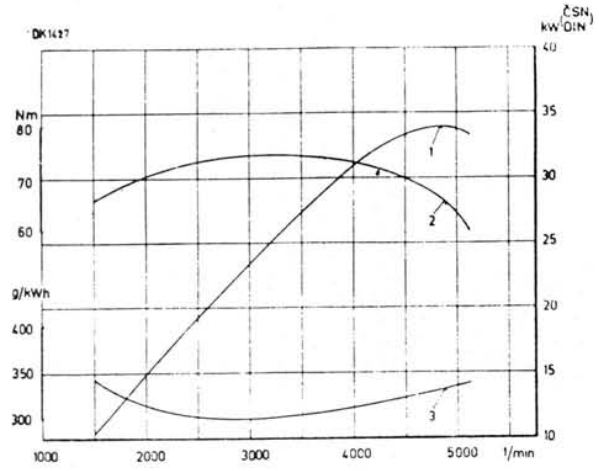


Fig. 2.5/1 - Power Output and Fuel Consumption Diagram - Škoda 150 S engine

1 - power output, 2 - torque, 3 - specific fuel consumption

k/SAE = h. p. (SAE) 1/min = r. p. m.

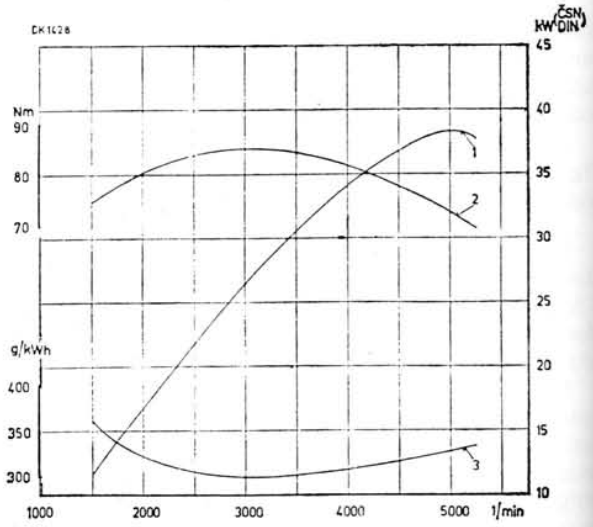


Fig. 2.5/2 - Power Output and Fuel Consumption Diagram - Škoda 120 L engine

1 - 3 see Fig. 2.5/1

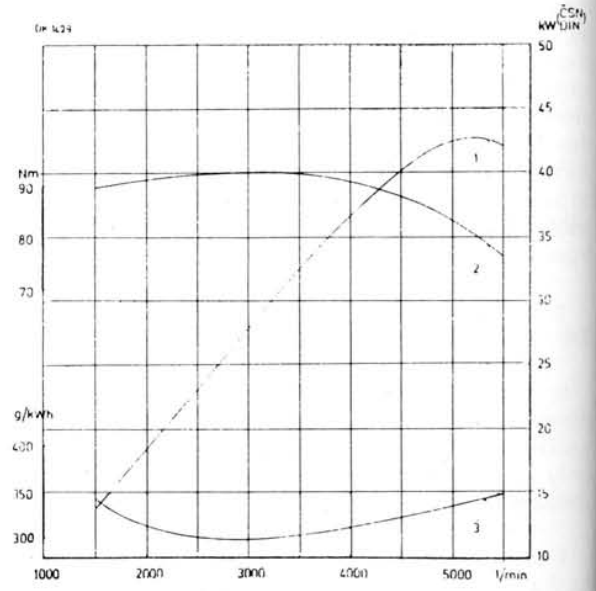


Fig. 2.5/3 - Power Output and Fuel Consumption Diagram - Škoda 120 LS engine

1 - 3 see Fig. 2.5/1

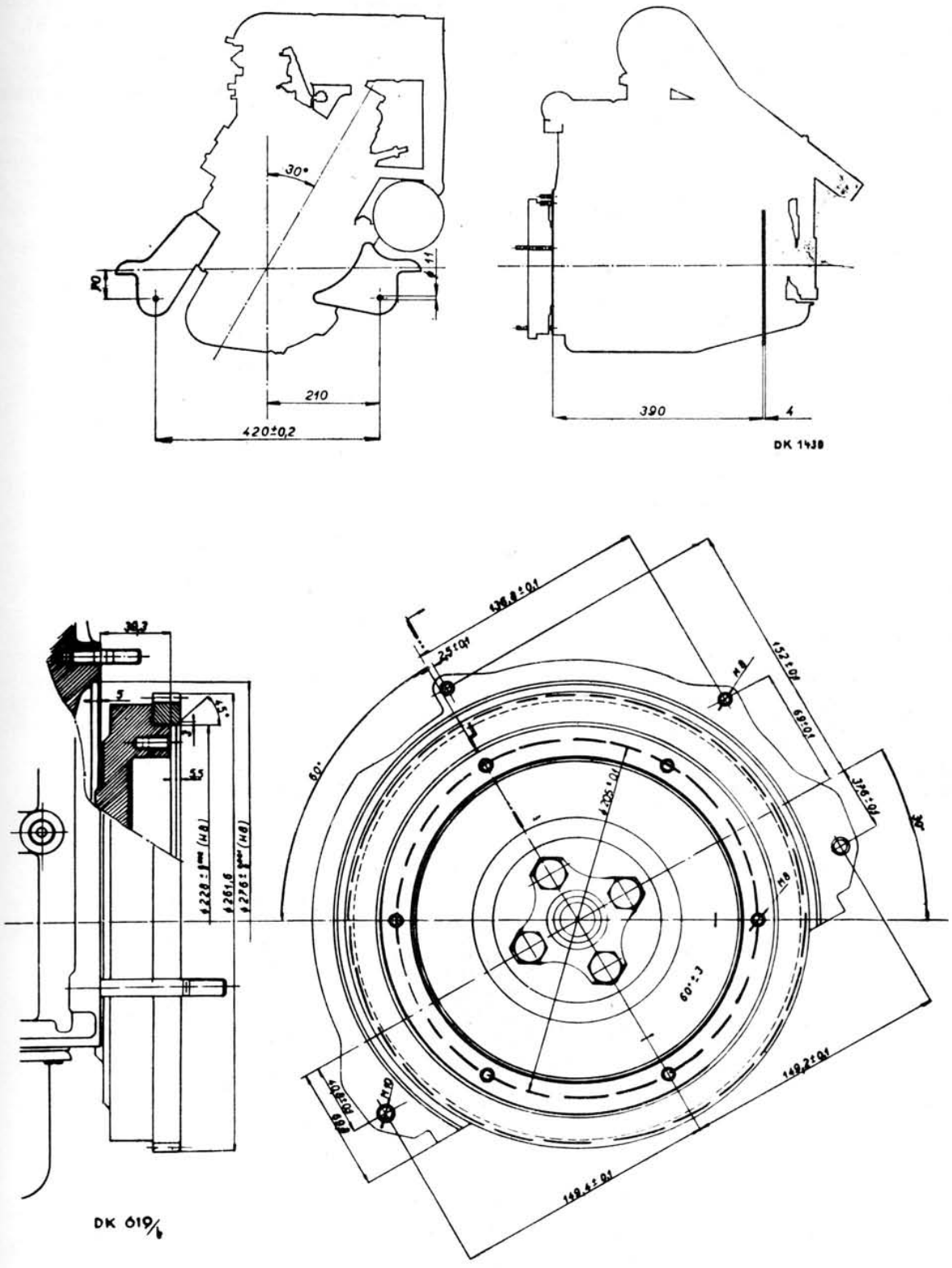


Fig. 2.5/4 - Mounting Dimensions of Engine and Flywheel

For the installation of the engine on the test bench, we indicate the dimensions of the engine flange and flywheel. During braking, the engine and the engine oil must be properly cooled to preclude exceeding the optimum service conditions, i. e. water temperature of about 80 to 90 °C, and oil temperature of 120 °C maximum - see Chapter 2.5, paragraph 51.

Engine Lubrication

The inner lubricating oil distribution system is shown in Fig. 2.5/5.

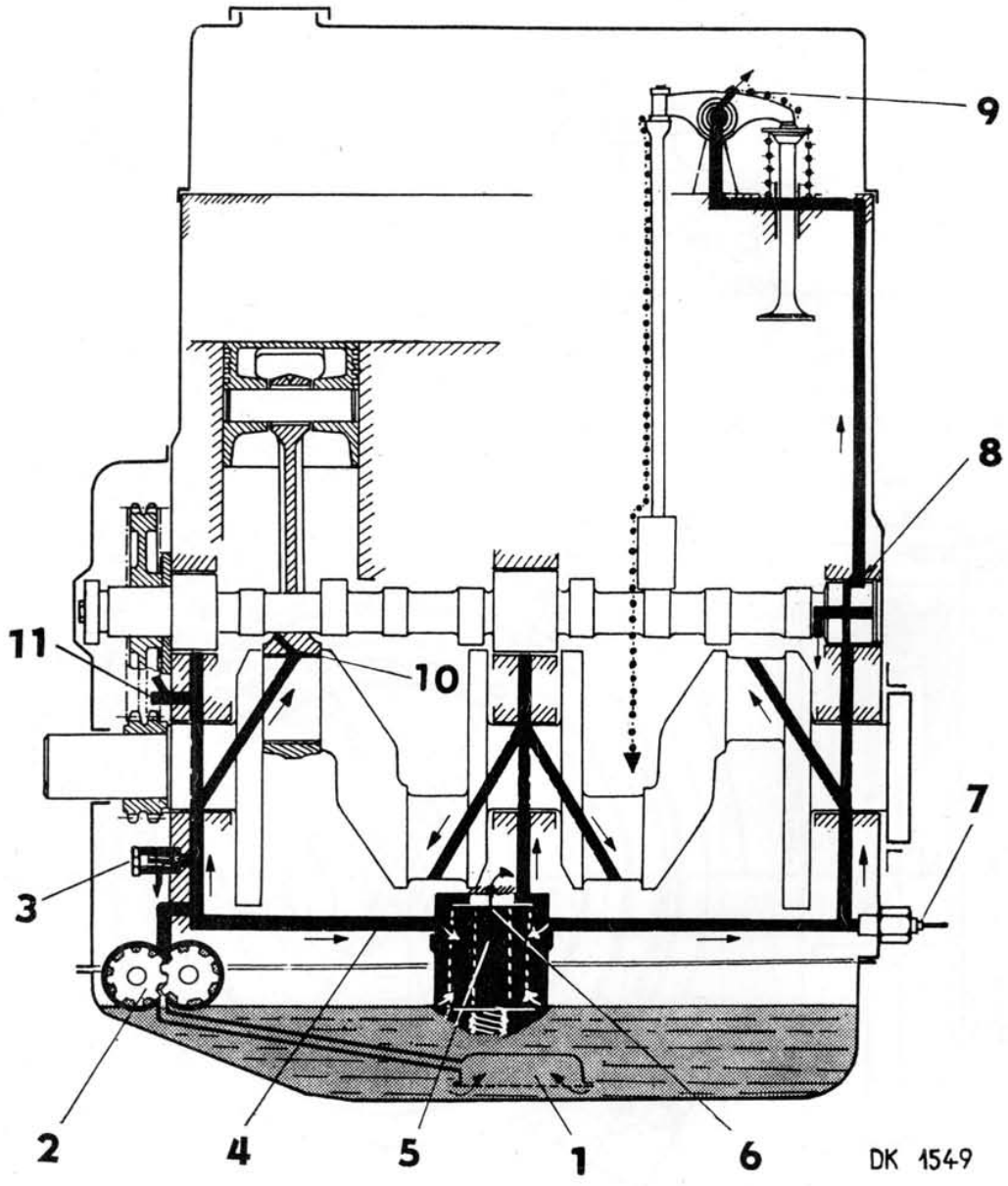


Fig. 2.5/5 - Engine Lubrication Diagram

Škoda 120 LS engine has, in addition, an oil cooler incorporated between the pump delivery branch on the timing gear cover and the main oilway (see Fig. 11.9)

1 - suction strainer, 2 - pump, 3 - pressure relief valve, 4 - main oilway, 5 - oil filter, 6 - by-pass oil hole, 7 - oil pressure switch, 8 - pulsating chamber, 9 - rocker arms, 10 - connecting rod splash hole, 11 - chain splash screw

2.6 CYLINDER BLOCK

The cylinder block is a light-alloy die casting machined complete with bearing covers and the crankshaft rear cover. All the remaining parts, forming with the block an assembly unit, are made separately and fitted additionally. Blocks for cylinder bores of dia. 68 mm and 72 mm differ only by their bores for cylinder liners.

Oilways, Bolts, Plugs, etc.

a) Before fitting plugs into the oilways of a new cylinder block (if it is to be completely assembled), clean them with a gun rod and blow through with compressed air.

b) Coat the screw plugs with a sealing compound or paint before screwing them down into the oilways.

c) Likewise coat the stud bolts protruding into the engine interior with a sealing compound or paint. If it is necessary to replace one of the cylinder head stud bolts, use a thicker one (of larger diameter within the tolerance limits indicated in the Catalogue of Spare Parts) to ensure its firm hold in the block.

d) Tighten the screw plug of the water jacket at cylinder No. 4 after having put a seal ring under it.

e) Fasten the partition of the oil filter over the cap of the oilway to the camshaft bearing. Fasten the cap with a screw, and the partition with a bolt and spring washer.

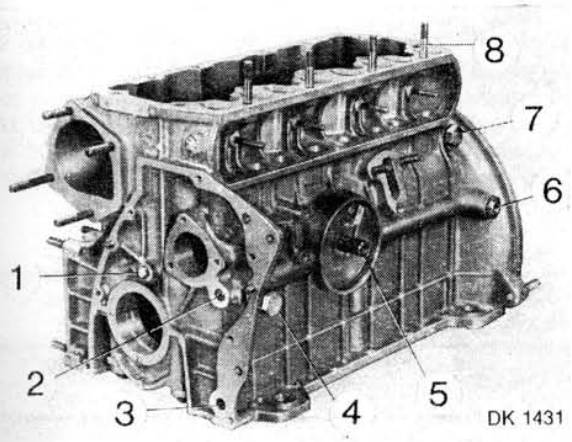


Fig. 2.6/1 - Oilways, their Accessories, and Water Jacket Plug Screw

1 - chain grease cup, 2 - main oilway - front plug, 3 - inlet channel from pump, 4 - pressure relief valve, 5 - screw and oil filter partition with cap, 6 - connection for pressure gauge or inlet from oil cooler, 7 - water jacket screw plug, 8 - oilway to cylinder head

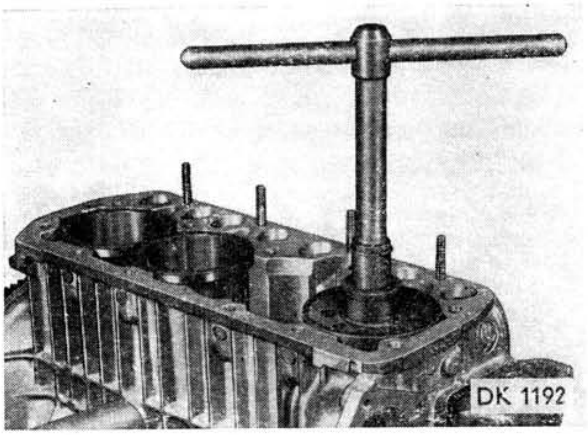


Fig. 2.6/2 - Dressing Mating Surfaces of Recess for Cylinder Liners Using MP 1-106 Dresser

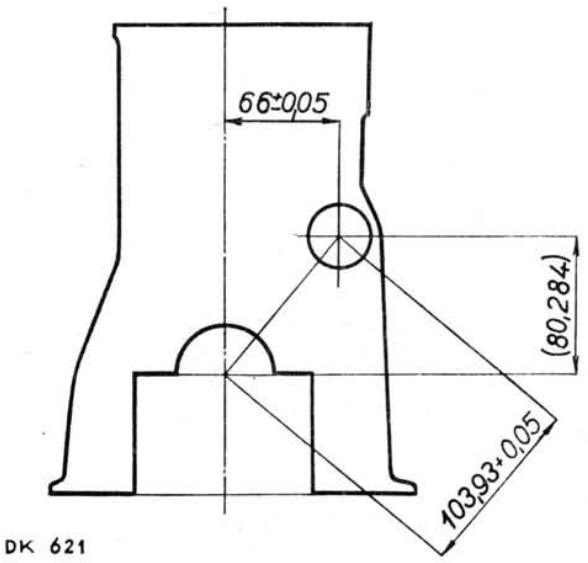


Fig. 2.6/3 - Centre Distances of Crankshaft and Camshaft

f) Tighten the grease cup of the chain so that the lubrication hole is in line with the water pump, i. e. deflected by about 45° from the centre line of the cylinders in the block. Lock the grease cup in this position, preferably by a punch mark.

Handle the punch with a "light hand". An unnecessarily high and uneven pressude is apt to result in the removal of a thick and uneven chip and the necessity of a deep spot facing of the contact area.

Pressure Relief Valve

Assemble the valve in the following order: ball, spring, seal, and valve screw. When first assembling the valve, tap the ball home in the

seat in the cylinder block using a copper or aluminium rod.

Reconditioning Recesses for Cylinder Liner Flanges

Before assembling a used cylinder block, inspect and clean thoroughly the mating surfaces of the recesses for cylinder liner flanges. If chemical agents (petrol, etc.) fail to have the required effect, or if the surfaces have been damaged mechanically, use the MP 1-106 dresser, or the MP 1-157 jig with universal guide rings.

Reconditioning of Camshaft Bearings

If an oversize camshaft is to be fitted (excessive bearing clearances in an otherwise sound block), drive out the plug on the rear side of the cylinder block and ream the bearings to dimensions specified in the following Table:

Bearing No.	Diameter of bearing in cylinder block mm		Diameter of camshaft journals mm	
Standard camshaft				
I	39	+0.025	39	−0.050
II	38.5		38.5	−0.025
III	30	+0.021	30	−0.041 −0.020
Oversize camshaft				
I	39.2	+0.025	39.2	−0.050 −0.025
II	38.7		38.7	
III	30.2		30.2	

The numerical symbols of the bearings (I–III) indicate the respective front, centre, and rear bearings.

Close the newly machined bore with a new plug and seal it with a dab of paint. A poor sealing would result in oil leaking from the engine into the clutch.

When reboring the bore for the camshaft, observe the centre distances of the crankshaft and camshaft. Otherwise the timing chain will be either too slack or too taut. For the correct distances see Fig. 2.6/3.

Reconditioning of Valve Tappet Guides

If there is an excessive clearance in the guides (bearings) of the valve tappets, it is possible to recondition the guides and to replace standard tappets by tappets of a larger diameter. The centre line of the bearings is perpendicular (normal) to the seating face of the cylinder block. The relative dimensions of the bearing and tappet are specified in the Table below:

Valve Tappet	Diameter of Bearing in Cylinder Block, mm		Tappet Diameter mm	
Standard	21	+0.021	21	−0.020
Oversize	21.2		21.2	−0.007

2.7 CRANKSHAFT AND ITS ACCESSORIES

The crankshaft has three main bearings and four crankpin bearings. It is a forging with soft, not hardened journals. When worn, it must be reground to dimensions as per Table for fitting oversize big-end and main bearing shells as well as an oversize guide ring.

Crankshaft Bearing (for clutch shaft)

It will be driven or pressed into the shaft lubricated with the recommended grease with its cover turned outward. After its pressing-in, add additional grease by forcing it into the shaft bore behind the bearing.

Use the extractor MP 1-109 for the removal of the bearing.

To Grind the Crankshaft

For grinding the journals, clamp the crankshaft by the conical surfaces of the shaft ends between the centres of the grinding machine. The rear conical surface is under the bearing and therefore the bearing must be removed - for details see the paragraph dealing with the bearing.

For grinding the crankpins use individually prepared fixtures - plates, which have to be clamped to the shaft end. The lift of the crankpins must be 36 ± 0.05 mm and their permissible misalignment with respect to the plane passing through the centre line of the journals and the first crankpin is 0°30′ maximum.

For grinding the journals use a grinding wheel with a radius according to Fig. 2.7/2.

With the exception of the first crankpin, of which also the face has to be ground, feeding of the grinding wheel as per Fig. 2.7/2 is recommended. In the instance corresponding to the section "B" of the drawing, the grinding wheel is permitted to touch the end faces, however without enlarging the crankpin length.

Size of Journals	Journal length "a" mm	Length tolerance mm	Dia. d mm	Journal tolerance mm	Dia. d mm	Journal tolerance mm
Standard size	31.5		45		55	
1st regrinding	31.625		44.75		54.75	
2nd regrinding	31.75	+0.025	44.50	−0.009	54.50	−0.010
3rd regrinding	31.875	−0	44.25	−0.025	54.25	−0.029
4th regrinding	32		44		54	

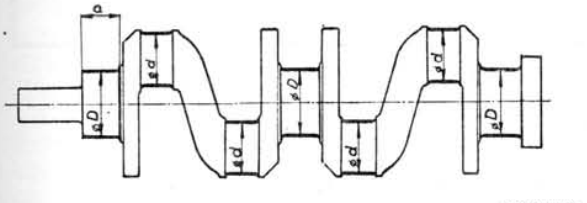


Fig. 2.7/1 - Reconditioning Crank Journals - the reconditioned surfaces are drawn in heavy lines

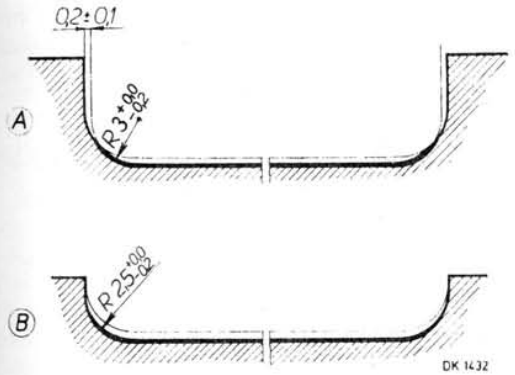


Fig. 2.7/2 - Grinding Crank Journals - grinding wheel radius and feeding of wheel to side surfaces of crankshaft webs

A - at journals with the exception of the first journal - see the Table and explanation
B - at crankpins

External Correlation of Journal Length ("a") and Guide Ring Thickness

Nominal crankshaft journal diameter	Journal length "a" mm	Length tolerance	Guide ring thickness mm	Tolerance mm
Standard - dia. 55	31.5		1.490	
1st regrinding - dia. 54.75	31.625		1.615	
2nd regrinding - dia. 54.50	31.75	+0.025	1.740	−0.01
3rd regrinding - dia. 54.25	31.875		1.865	
4th regrinding - dia. 54	32		1.990	

Guide Rings

Regrinding of the face of the front crankshaft web results in an increased (axial) play of the shaft.

Replace therefore the original guide ring with an oversize one.

Oversize guide rings are fitted exclusively to the reground lateral face of the crankshaft web. Standard size rings should be always fitted to the thrust ring side (next to the timing gear).

Thrust Ring

If the thrust ring under the crankshaft timing gear (sprocket) abutting against the guide ring is worn to an extent which makes damage of the guide ring likely, replace it with a new one or regrind it.

The maximum permissible regrinding is, however, to a thickness of only 3.75 mm.

Crankshaft Main Bearing Shells

Fit the crankshaft main bearings (shells) according to the respective nominal diameter of the crankshaft journals. The shells are not provided with a diameter symbol so that they have to be checked for the respective wall thickness with a micrometer.

Matching Crankshaft Main Bearings with Journals

Nominal crankshaft journal diameter mm		Thickness of bearing shell wall mm	Tolerance limit of wall thickness mm
dia. 55	- standard	1.497	
dia. 54.75	- 1st regrinding	1.622	
dia. 54.50	- 2nd regrinding	1.747	−0.007
dia. 54.25	- 3rd regrinding	1.872	
dia. 54	- 4th regrinding	1.997	

If one of the shells is worn or damaged, **all** crankshaft main bearing shells must be replaced without fail!

For the respective correlation of the crankpins and connecting rod big-end bearings see Chapter 2.11.

2.8 FLYWHEEL WITH GEAR RING

Balancing - Removal and Refitting

A new flywheel assembly is a statically balanced unit, its maximum permissible residual out-of-balance weight being 10 gcm. The final

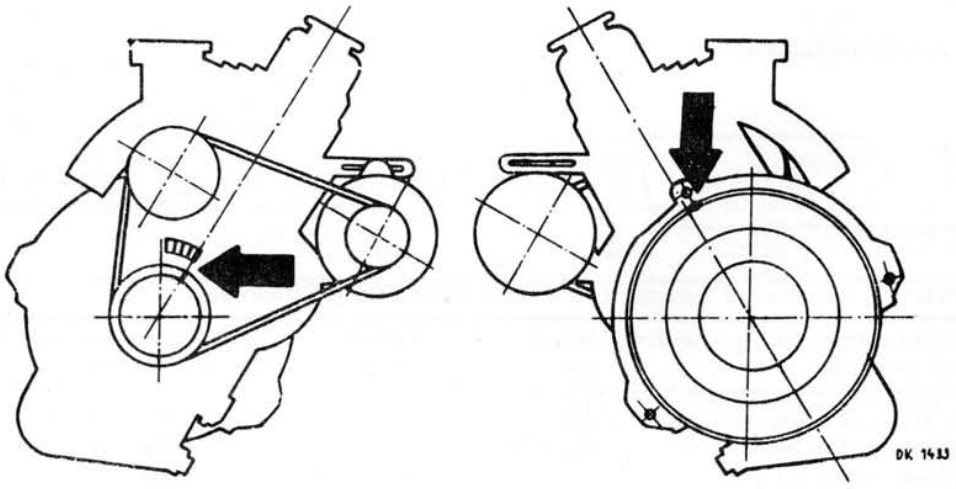


Fig. 2.8/1–Marking Correct Position of Flywheel on Crankshaft (prior to removing the flywheel)

dynamic balancing of the entire crank mechanism should be effected in a completely assembled engine.

Thus it is necessary to mark the correct position of the flywheel with respect to the crankshaft before its removal if there is no mark left from a previous flywheel removal.

When marking the position, set the timing mark on the crankshaft belt pulley opposite the zero line of the scale on the timing gear cover and provide the flywheel with a dot or another mark opposite the bolt in the flange of the cylinder block. The maximum out-of-balance of the removed flywheel will be greater than 10 gcm since the correction of the unbalanced masses of the crankshaft mechanism has been concentrated in it with the exception of the crankshaft belt pulley in the form of drilled holes round its circumference. Turning the flywheel into another position would result in interference with the balance of the engine.

For this reason be sure to refit the flywheel on the crankshaft in its original correct position, i.e. according to the setting of the crankshaft belt pulley and the marks made before the flywheel was removed.

When replacing an old flywheel with a new one or when replacing its gear ring, proceed as follows:

1. Fit the new flywheel in any position. Its residual out-of-balance weight cannot substantially affect the balance of the crank mechanism.

2. The gear ring alone cannot affect the balance of the flywheel but the old flywheel has a higher out-of-balance weight due to the correction of the entire crank mechanism balance. It is therefore necessary to install it according to the respective marks (see previous paragraphs). Tighten the flywheel bolts (as per Chapter 1.3) and lock them in position by bending the tab washers.

To Replace the Gear Ring

Replace the gear ring if the teeth are badly worn or damaged. When withdrawing the gear ring, take care not to diminish unnecessarily the interference fit of the flywheel (by abrasion). The interference (shrinkage) fit is of prime importance since the flywheel - gear ring assembly transmits the driving torque of the starter motor pinion.

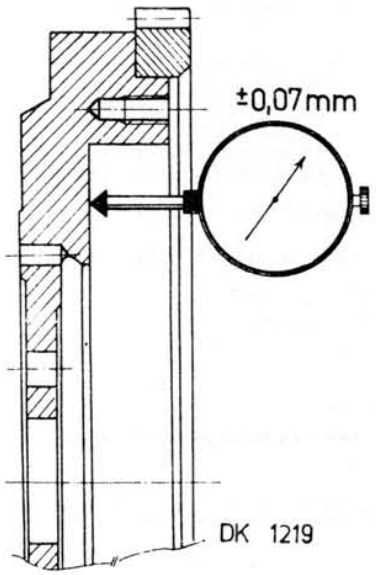
The gear ring can be either pressed off or removed by destruction. For pressing off, a support pad can be made according to the drawing MP 1-153. Use a welding torch for locally heating the gear ring immediately before pressing it off. The drawing will be supplied by the car manufacturer on request.

When using the other method, grind off the front face of the gear ring (hardened surface) and drill off the gear ring below a tooth space using a drill of 12 to 13 mm diameter. Finish drilling with a finishing bit in order not to damage the flywheel. The gear ring breaks and can be easily removed.

When shrinking on a new gear ring, heat it in a furnace to a temperature of 180 to 200 °C, place it on a flat plate and install in it the flywheel. Tap home the flywheel lightly if necessary, and let the assembly cool down.

To Recondition Friction Surface for the Clutch

When reconditioning the friction surface for the clutch take care that the plane of this surface is parallel with the seating face of the flywheel on the crankshaft. When clamping the flywheel on its perpiphery, align it according to this seating face. It is advisable, however, to make an auxiliary clamping fixture to fit on this face. Measure the permissible run-out of the friction surface of ±0.07 mm midway along its width.



2.9 CYLINDER (LINER)

The cylinders are separate, the cylinder liners of special grey cast iron being inserted into the cylinder block. The basic nominal cylinder bore is 68 or 72 mm, depending on the engine model. If the wear exceeds 0.1 mm, the liner must be replaced with a new one or rebored to the next nominal diameter in accordance with the cylinder classification table, and oversize pistons have to be used.

Cylinder liners of each diameter group are classed in tolerance classes A, B, and C, according to the production tolerance limits.

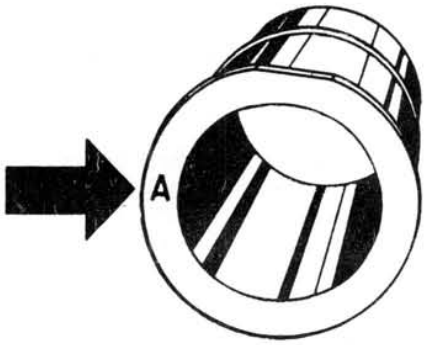


Fig. 2.9/1 - Marking of Cylinder Tolerance Class

Grade the rebored cylinder liners in the same manner while adding the number of the respective rebore before the designation of the tolerance class according to the classification table, for example dia. 68.25 1A, dia. 68.50 2A. However, only cylinder liners of a nominal diameter of 68 mm can be rebored. Worn liners of 72 mm nominal diameter have to be replaced with new ones.

For the cylinder liner and piston assembly see Chapter 2.12.

Check the diameter (bore) at a temperature of 20 °C which must be constant for both the cylinder liner and gauges.

Machining (Reboring) Cylinders

For machining (reboring), the cylinder should be clamped only in the axial direction to preclude any distortion and deformation of its bore. Depending on the machine used for reboring, make a centering head to be centred

Grading of Cylinder Liners According to Diameters and Tolerance Classes

Nominal diameter mm	Tolerance and rebore class	Diameter mm	Diameter tolerance
Dia. 68 (standard)	A	68.00	
	B	68.01	
	C	68.02	
Dia. 68.25 (1st rebore)	1A	68.25	
	1B	68.26	+ 0.009
	1C	68.27	
Dia. 68.50 (2nd rebore)	2A	68.50	
	2B	68.51	
	2C	68.52	
Dia. 72	A	72.00	
	B	72.01	+ 0.009
	C	72.02	

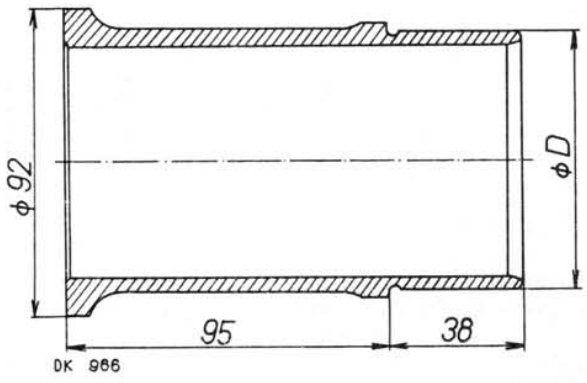


Fig. 2.9/2 - Outside Dimensions of Cylinder Liner

Cylinder bore 68 mm . . . . dia. D = 75f7

Cylinder bore 72 mm . . . . dia. D = 76f7

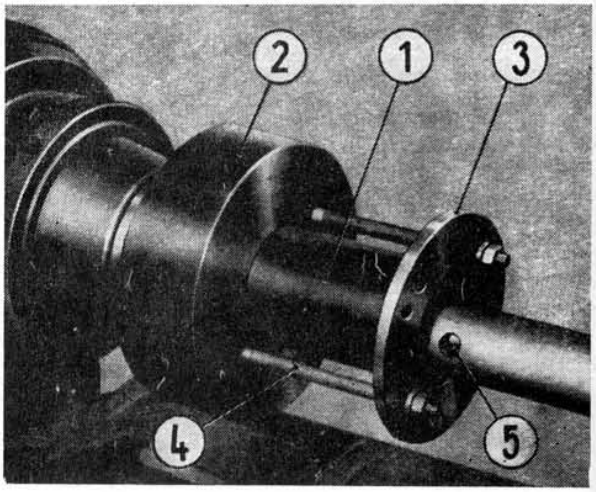


Fig. 2.9/3 - Machining the Cylinder

1 - cylinder liner, 2 - centering head, 3 - clamping plate, 4 - clamping bolts, 5 - cutting tool

directly on the drive spindles. The bore to take the cylinder liner should have a clearance of about 0.03 mm (for a diameter of 75.00 or 76.00 mm). It is advisable to make the bore and the front thrust face after having fitted the centering head on the machine. Such machining of the cylinder is shown in Fig. 2.9/3.

Outside dimensions of the cylinder liner are indicated in the respective drawing (Fig. 2.9/2).

2.10 PISTON WITH GUDGEON PIN AND PISTON RINGS

The piston of light alloy has a flat head, (pistons dia. 68 mm or dia. 72 mm for Škoda 120 L car engines) or a convex head (for engines of Škoda 120 LS cars). Geometrically, the piston skirt is a combination of cylindrical, elliptical, and conical surfaces.

Pistons with a nominal diameter of 68 - 68.25 and 68.50 mm are classified in three dimensional groups, the pistons with 72 mm nominal diameter forming one group. According to production tolerances, pistons of each dimensional group are classified into tolerance classes A, B, and C, and graded according to their weight.

All the classification and grading values are marked on the piston head. Weight is expressed in grammes in excess of 200 gr., for example 72 indicates the weight of 272 gr.

For the assembly of the piston with the cylinder liner see Chapter 2.12. The weight with a tolerance of ± 1 gr. is taken as the standard weight of the piston assembled with the connecting rod.

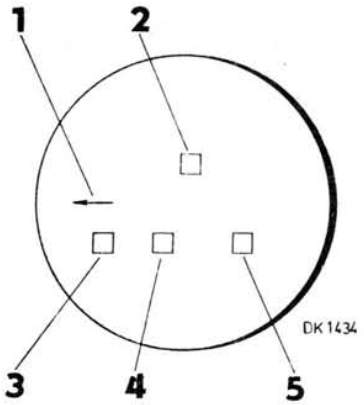


Fig. 2.10/1 - Classification Code on Piston Head - Key to Symbols:

1 – arrow - direction of engine rotation, 2 – manufacturer's mark, 3 – dimensional class marked only on pistons of 68 mm nominal diameter: dia 68 mm pistons without marking, dia. 68.25 mm marked 1, dia. 68.50 mm marked 2, 4 – tolerance class, 5 – weight

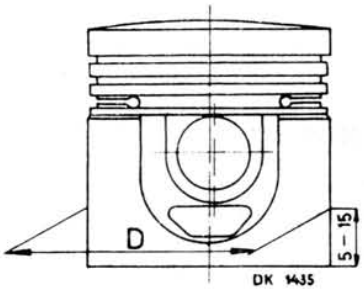


Fig. 2.10/2 – Point of Measuring the Piston when Checking its Diameter (normal to gudgeon pin, and height from piston bottom edge)

Grading of Pistons According to Diameters and Tolerance Classes

Nominal diameter mm	Tolerance and dimensional (oversize) class	Diameter "D" per Fig. 2.10/2 mm	Tolerance of "D" diameter mm
68 (standard)	A	67.95	
	B	67.96	
	C	67.97	
68.25 (for 1st rebore)	1A	68.20	
	1B	68.21	- 0.009
	1C	68.22	
68.50 (for 2nd rebore)	2A	68.45	
	2B	68.46	
	2C	68.47	
72	A	71.95	
	B	71.96	- 0.009
	C	71.97	

Check the diameter at a temperature of 20 °C which must be constant for both the piston and the gauges.

Table of Matching Gudgeon Pins to Pistons and Small-end Bushes

Nominal diameter mm	Gudgeon pin diameter mm	Pin bore in piston mm	Connecting rod small-end bore (bush diameter) mm
20	20 $^{-0.003}$	20 $^{-0.004}_{-0.010}$	20 $^{+0.005}_{-0.001}$
20.05	20.05 $^{-0.003}$	20.05 $^{-0.004}_{-0.010}$	20.05 $^{+0.005}_{-0.001}$

GUDGEON PIN

The gudgeon pin is a slight interference fit in the piston. Its clearance in the connecting rod small-end bush is specified in the Chapter "Connecting Rod".

The steel gudgeon pin is hollow and has a nominal diameter of 20 mm, replacement pins having a nominal diameter of 20.05 mm. When fitting an oversize gudgeon pin with 20.05 mm nominal diameter, the bore taking the pin must be reamed to dimensions specified in the respective Table.

PISTON RINGS

To ensure their correct function, they must be fitted in the correct position, they must have no or only a minimum clearance along their circumference, a small clearance in the gaps, and they must move freely in the piston grooves.

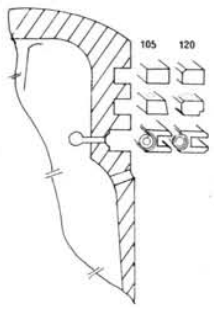


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Fig. 2.10/3 - Sequence and Method of Fitting Piston Rings (Mark Positioning).
From top to bottom: chromium-plated compression ring, bevelled compression ring, spring loaded expanding oil control ring

Fit the first ring in any arbitrary position (its cylindrical chromium-plated peripheral part is chamfered on either side, facilitating identification), the second, bevelled ring with the lettering "TOP" or another mark on top, and the oil control ring with its outer sharp edge pointing downward. If there is any doubt as to the correct selection of the rings, check them for proper sealing in the cylinder before assembly. Insert the ring into the cylinder and level it by pushing home the piston head. In the case of a used cylinder, insert the ring about 20 mm below the top edge of the cylinder liner, i.e. a place where the cylinder liner is already worn, while checking for the right clearance in the piston groove and for the correct gap in the cylinder bore.

For rings that have not been run-in, the following circumferential gap or contact clearance with regard to the cylinder liner is permissible: none for the chromium-plated compression ring, two in a total range of an angle of 35 degr. for the bevelled compression ring and the oil control ring. Larger contact clearances along the circumference denote either an incorrect selection of the ring, for example the ring does not correspond to the cylinder bore, or an excessive wear of the cylinder liner.

Check the ring gap clearance using feeler gauges. For new compression rings, this gap clearance should be 0.25 to 0.40 mm, for new oil control rings 0.20 to 0.35 mm. The maximum permissible clearance of worn rings is 1 mm.

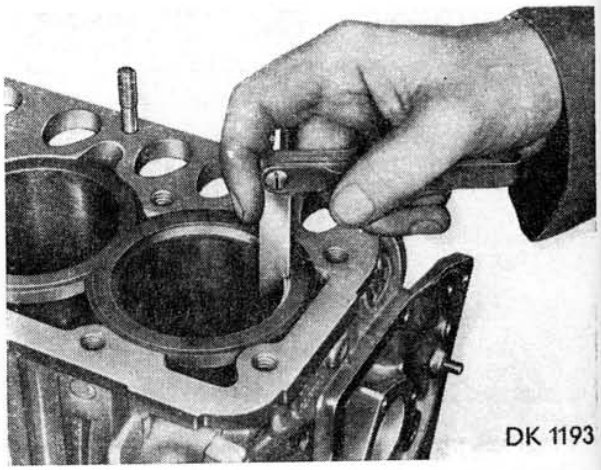

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Fig. 2.10/4 - Checking Piston Ring Gap

The clearance of rings in the piston grooves should be at least 0.03 mm. Since checking this clearance is difficult, make at least sure that the rings move freely in the grooves.

2.11 CONNECTING ROD

The connecting rod is a steel forging with a bronze bush in the small end and thin-walled bearing shells (steel with special babbit lining) in the big end.

Before refitting the connecting rod, check it for compliance with the following requirements: weight, alignment of the small and big end, and matching with the gudgeon pin and crankshaft.

For its assembly with the piston see Chapter 2.12.

To Check Connecting Rod Weight

Connecting rods are manufactured in two weight groups with a difference of 12 gr. In the factory, lighter connecting rods are marked with yellow paint, the heavier with blue paint. Should the marking be damaged (obliterated) during storage or after the connecting rod has been fitted in the engine, the weight must be determined by weighing. To adjust the weight, remove a chip from the forged bosses on the small and big end. The difference of weight of the small and big ends of a connecting rod in the engine must not exceed a total of 4 gr. (±2 gr.).

When replacing only one connecting rod, adjust its weight in accordance with one of the connecting rods remaining in the engine.

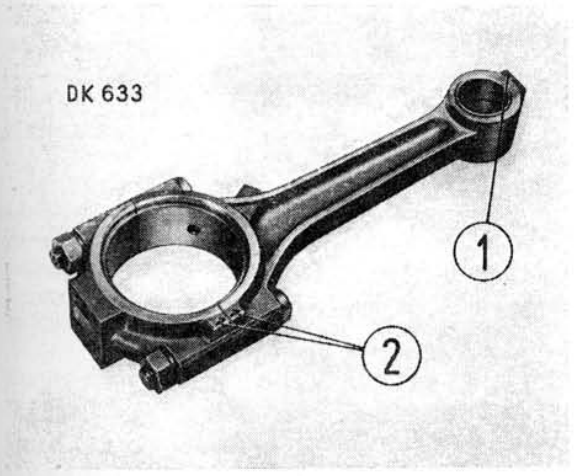


Fig. 2.11/1 - Connecting Rod

1 - balancing boss
2 - numerical code according to cylinders

For weighing a connecting rod, support it in the centre line of the small and big end in a strictly horizontal position. The illustration shows the weighing of a connecting rod, the big end of which is supported on a specially made pin and prisms on the balance while the small end rests on a support, on which the gudgeon pin and prisms have been placed.

The weight of the small end can be obtained by subtracting the weight of the big end from the total weight of the connecting rod, or by weighing it in the same way as the big end.

When removing the chip, take care not to disturb the connecting rod strength. The small end boss must never be lower than 13 mm below the small end centre line.

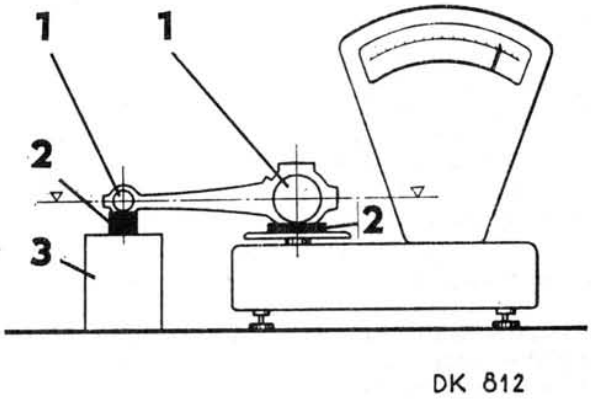


Fig. 2.11/2 - Weighing Connecting Rod Big End
1 - pins, 2 - pin supporting prisms,
3 - connecting rod support

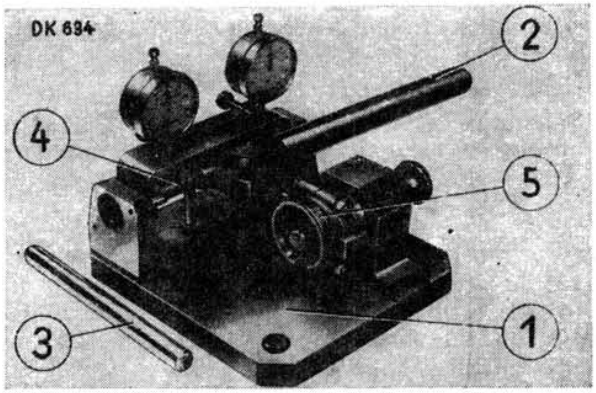


Fig. 2.11/3 - Checking Connecting Rod Small and Big Ends for Misalingment and their Alignment

1 - MP 1-102 (MP 1-159) fixture, 2 - MP 1-103 connecting rod straightener, 3 - adjusting pin, 4 - pilot gudgeon pin, 5 - clamping yoke

Small End and Big End Alignment

A misalignment of the centre line of the small-end bush and big-end bearing or the bore for the big-end bearing shells must never exceed 0.03 mm per 100 mm of the connecting rod length. For checking and alignment use the MP 1-102 or 1-159 fixture.

Insert the adjusting pin into the fixture and set both its dial indicators to zero. Clamp the connecting rod without shells into the fixture, thread the pilot pin in it, and swing down the connecting rod. The readings of the dial indicators will show any misalignment of the small and big end. The maximum misalignment must not exceed 0.03 mm as already mentioned. Check for misalignment in two planes by tilting the dial indicators.

Two pilot pins are supplied, one with a diameter of 20 mm, the other with a diameter of 20.05 mm, to match the gudgeon pins.

To Match Connecting Rod with Gudgeon Pin and Crankshaft

With regard to the reciprocating movement of the piston, the gudgeon pin must have the smallest possible clearance in the connecting rod small end (any larger clearance results in pin knocking). Therefore select from several gudgeon pins one which will be a close running fit in the small-end bush. If no such pin is available, ream the bush but never exceed the maximum tolerance limits.

An oversize bush has to be reamed to a nominal diameter of 20.05 mm. For the respective dimensions refer to the Table supplied with gudgeon pins. The big-end bearings (shells) should be selected according to the nominal diameter of the crankpin. The shells have no diameter marking and have to be identified by measuring their wall thickness with a micrometer.

Matching Big-end Bearing shells with Crankpins

Matching Crankpin nominal diameter mm	Big-end bearing shell thickness mm	Tolerance mm
45 (standard)	1.490	
44.75 (1st regrinding)	1.615	
44.50 (2nd regrinding)	1.740	−0.007
44.25 (3rd regrinding)	1.865	
44 (4th regrinding)	1.990	

Numerical Identification of Connecting Rods

For better identification, figures can be stamped on the bosses of the connecting rod big end (see Fig. 2.11/1). The figures correspond with the number of the respective cylinder with which the connecting rod is assembled. When replacing a connecting rod, provide the new connecting rod with its very same identification number. Stamp the figures as much toward the far end of the boss as possible to avoid fouling the lateral guide face.

2.12 CYLINDERS, CONNECTING RODS AND PISTONS

a) **Only a cylinder (liner) and piston of equal diameter and the same tolerance class can be assembled as a unit.**

b) **The engine as an assembly unit can be fitted only with cylinder liners and pistons of the same diameter, the pistons being of the same weight group.**
The individual cylinder-and-piston assemblies can be, however, of different tolerance classes. On the other hand, connecting rods of only the same weight group can be used.

These are the conditions for the correct operation of pistons in the cylinders and for the correct balancing of the crank mechanism. For details concerning dimensions (diameters), tolerance classes (cylinder liners, pistons) and weight groups (connecting rods and pistons), refer to the chapters dealing with the individual parts.

To Assemble Cylinder Liner with Piston and Connecting Rod

1. Take cylinder liners and pistons with matching dimensions, i.e. cylinder liners of the same bore (they need not be necessarily of the same tolerance class), pistons of the same diameter and tolerance class to match those of the cylinder liners and of the same weight, and connecting rods, all of one of the two weight groups.

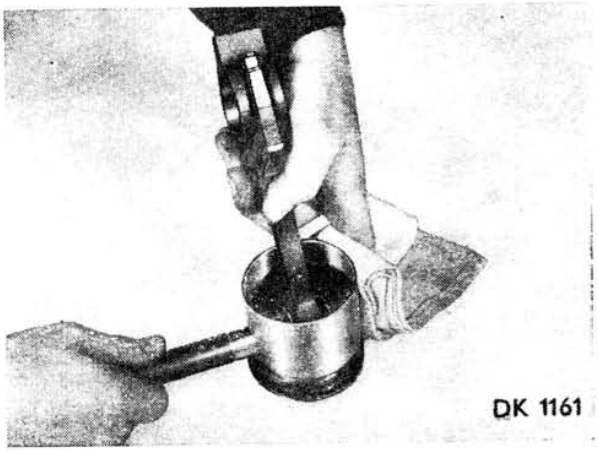


Fig. 2.12/1 – Press-fitting of Gudgeon Pin into Piston Using MP 1-104 Drift

2. Install the liners into the cylinder block according to paragraph 13 of the Chapter 2.3. Select a piston and a connecting rod for each cylinder liner in keeping with the respective tolerance class; align the connecting rods (see the Chapter "Connecting Rod") and select matching gudgeon pins for them.

Sometimes tolerance limits of the gudgeon pin and the small-end bush clash so that the gudgeon pin cannot be inserted into the bush, in which it should be a running fit. If another, suitable gudgeon pin is not at hand, ream the bush.

Mark the connecting rods with numbers corresponding to the order numbers of cylinders with which they will be asembled. For the numerical code refer to the Chapter "Connecting Rod".

3. Using special pliers, place the circlip on the gudgeon pin and heat the piston to about 80 °C in a heating furnace or hot water.

Smear the gudgeon pin with oil and tap it home into the heated piston so that it protrudes some 1 to 1.5 mm beyond the piston hole edge, thread the oiled small-end bush on the gudgeon pin, and push the gudgeon pin as far as the circlip in the opposite piston hole. Finally slip on the other circlip. Use the special drift for pressing home the gudgeon pin.

Fit the connecting rod so that the splash hole in its big end faces the opposite side of the arrow on the piston head - see Fig. 2.3/6.

4. Fit the piston rings using special pliers or expanding the rings with the fingers. For details see the Chapter "Piston Rings". Check the rings for free movement in the piston grooves.

5. Press bearing shell halves matched with the crankshaft into the connecting rod big end and cover (see Chapter "Connecting Rods").

2.13 VALVE GEAR

In addition to the respective design characteristics, such as position and pattern of the cams and valve rocker ratio, the coupling of the camshaft to the crankshaft and correct valve clearance are factors of prime importance for the correct operation of the valve gear.

Valve Timing

With the valve clearance set to 0.45 mm:

Intake Valves	Škoda 105, 120 L	Škoda 120 LS
open before TDC	14°30′	14°30′
close after BDC	45°30′	45°30′

Exhaust Valves (After September 1977 120 LS same as 105/120)		
open before BDC	40°10′	46°30′
close after TDC	13°30′	7°30′

The camshaft is coupled with the crankshaft by means of a chain fitted on the timing gears (sprockets) so that 12 chain pintles (links) are between the timing (punch) mark on the crankshaft and the mark on the camshaft gear (the pintle over the mark on the crankshaft gear being the first and that over the mark on the camshaft gear the twelfth).

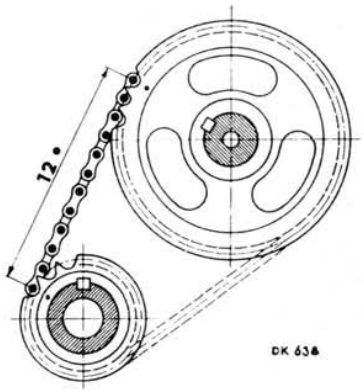


Fig. 2.13/1 - Timing Gears and Chain

Service Valve Clearance

Adjust the valve clearance on a cold engine according to the following Table:

	Intake valve	Exhaust valve
Škoda 105 and 120 L	0.15 mm	0.20 mm
Škoda 120 LS	0.20 mm	

To adjust the valve clearance, rotate the ball pin of the valve rockers as necessary. For checking the valve clearance use a feeler gauge inserted between the lands of the valve and the rocker arm. Adjust the clearance with the valve closed.

When the movement of the valve rocker arms of one cylinder alternates, the clearance of both valves of another cylinder can be adjusted while proceeding in accordance with the following diagram:

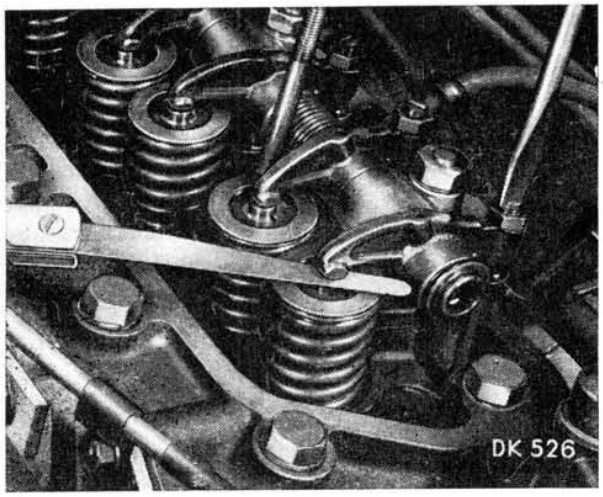


Fig. 2.13/2 - Valve Clearance Adjustment

Alternating	Adjust clearance on
cylinder No. 1	cylinder No. 4
cylinder No. 3	cylinder No. 2
cylinder No. 4	cylinder No. 1
cylinder No. 2	cylinder No. 3

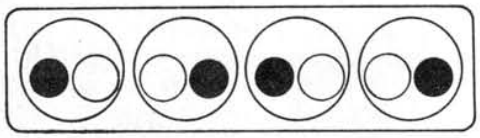


Fig. 2.13/3 – Valve Arrangement in Cylinder Head
Black disks - exhaust valves
White disks - intake valves

Timing Chain and Timing Gears

Modified chain and gears fitted since October 1979 recognised by squared gear teeth and chain with split rollers.

The timing chain has no slack adjuster (tensioner). A slack chain does not substantially affect the valve gear accuracy but its operation is noisy. Therefore its correct length should be ensured either

a) by selecting a suitable chain from a number of chains available - try it on the timing gears, or
b) by replacing the standard camshaft gear with an oversize gear (with greater tolerances). The camshaft gears are graded in keeping with their progressive size (tolerances) into classes A, B and C. With the exception of class A, the class marking letters are stamped next to the punch mark.

For trying, the chain can be disconnected to avoid removing and refitting of the timing gears. To recouple the chain, insert the coupling link from the chain front side and fit the clip from the rear with its open end pointing in the direction opposite to the chain movement.

Before starting work on the valve gear, remove the oil sump (engine bottom cover to which the timing gear cover is bolted, the suction strainer being attached to the crankshaft centre bearing cover) and lock the crankshaft in position in the axial direction by depressing the clutch pedal, if removal of the entire engine is not intended for another purpose. For special points of the removal refer to Chapter 2.4.

2.14 WATER PUMP

Disassembly

1. Unlock the washer of the belt pulley nut, remove the nut and pull off the belt pulley using the MP 1-120 puller (a fixture for Škoda MB 1000 cars) or a universal puller, for the bolts of which it is necessary to cut threads M 8 in the belt pulley holes.

By pulling off the belt pulley, access will be gained to the nuts fastening the pump to the engine. The same procedure holds good when dismantling the pump after it has been removed from the engine.

2. Withdraw the key from the shaft and, using the drift MP 1-121, drive or press out the shaft. Then lift away the housing plate from the seating face of the pump.

3. Remove the circlip locking the outer ball bearing in position. Proceeding from the rear side of the pump housing, drive out the ball bearings with their spacer tube, and remove the rubber sealing ring from the housing.

Reassembly

1. Smear the rubber sealing ring with grease and insert it into the pump housing. Use the MP 1-123 drift to drive home the inner ball bearing (without sheet guard) packed with grease. When applying the drift, fit its guide ring into the bore for the outer ball bearing.

2. Fit the gasket on the pump seating face and place the pump plate with its cemented-on gasket (facing outwards from the pump) over it. Fasten the plate to the pump provisionally with one bolt to prevent the gasket from being damaged during the following assembly jobs.

Insert the rubber seal, washer, and conical spring into the special (bakelite) sealing ring of the packing gland. Install the spring with its nose into the hole in the bakelite packing. Slip the assembled packing gland on the shaft with the spring toward the shaft gear, and drive the shaft home into the pump bearing, while supporting the bearing with the MP 1-123 drift.

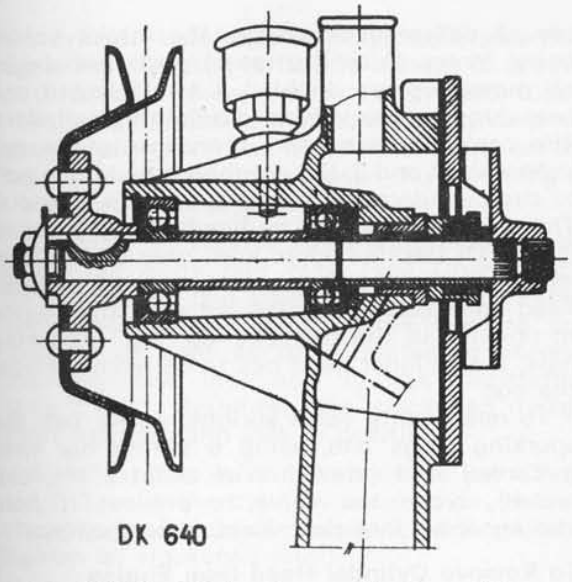


Fig. 2.14/1 - Water Pump - Sectional View

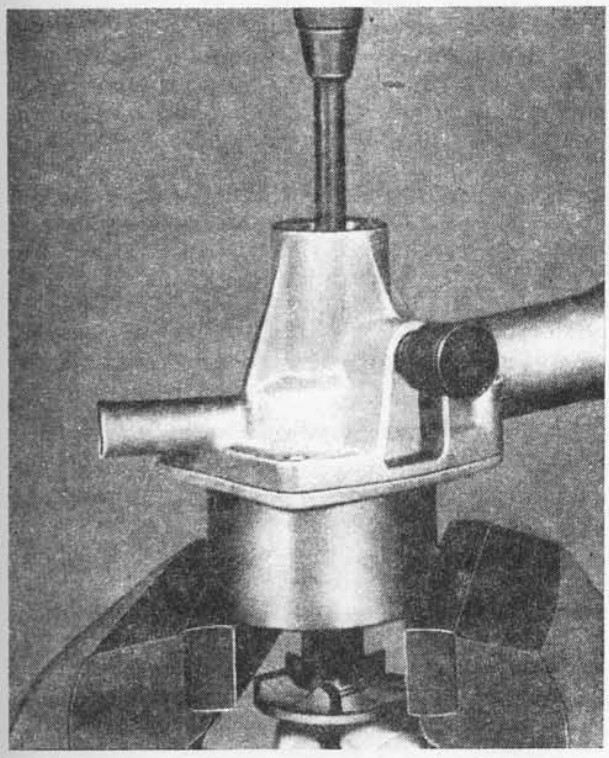


Fig. 2.14/2 - Driving Out Pump Shaft Using MP 1-121 Drift

4. Fit the ball bearing spacer tube on the shaft and use again the drift MP 1-123 for installing the outer ball bearing. Lock the bearing in position with the circlip after having packed it with grease. Drive the bearing home with its sheet guard (ball race) outside.

5. Tap the shaft in its axial direction to relieve the stress of the just installed bearings, fit the key in its keyway, tap home the belt pulley, and lock it in position with the aid of the washer and nut.

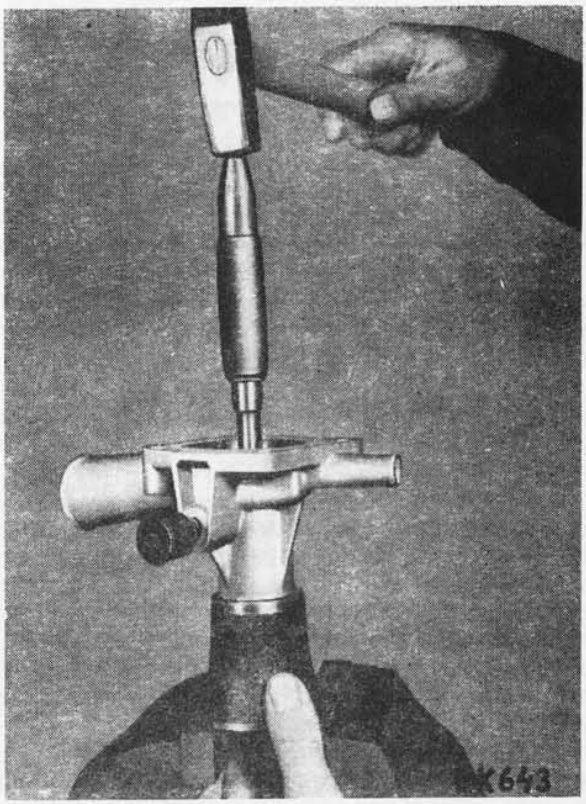


Fig. 2.14/3 - Driving Out Pump Bearings Using MP 1-122 Drift

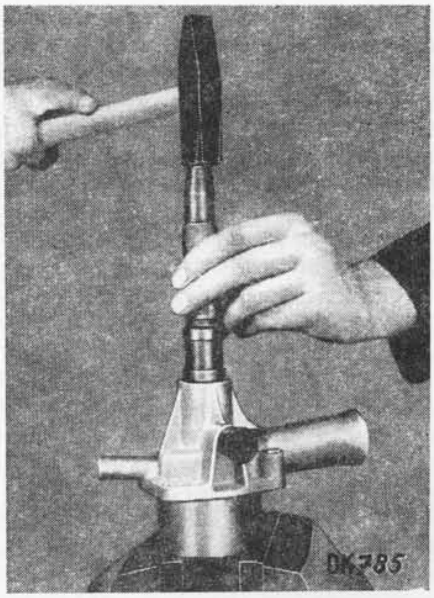


Fig. 2.14/4 - Driving Home Bearings Using MP 1-123 Drift

6. Complete the pump assembly by fitting the Stauffer lubricator filled with the recommended grease.

2.15 ROCKER SHAFT AND ROCKERS

Assembly (on Škoda 105 engine)

1. Install the lock ring, plain washer, and spring washer on the rocker shaft with both ends plugged. Smear the shaft with oil, fit the rocker (with its arm with the thrust face deflected toward the next assembled parts), the shim, the rocker support, and the other arm deflected toward the support, i.e. the complete rocker unit of cylinder No. 1.

2. Then slip the spring, the rocker, the support, the shim, and the next rocker, i.e. the complete rocker unit of cylinder No. 2, on the shaft.

3. Thread on the spring and, using the mirror arrangement of the assembled rocker units, install the rocker units of the remaining two cylinders. Use a lock ring supplemented with a plain and a spring washer to lock the assembled parts in position.

The rocker support of the cylinder No. 4 must be provided with an oil hole to provide for the supply of oil to the rocker shaft.

4. Compress the springs by holding down the rocker arms and lubricate all lateral contact surfaces with oil.

Assembly (on Škoda 120 L and 120 LS engines)

The rocker shaft is provided with two additional rocker supports fitted from the outside of the rocker units (the shaft is longer), replacing washers abutting on the lock rings. For the rest, the assembly is identical with the procedure described in paragraphs 1 to 4 above.

Note: Rocker arms on the Škoda 120 LS engine are shorter (18.5 mm) than those on the Škoda 120 L and Škoda 105 engines, in order to obtain a higher ratio.

Disassembly

Remove the lock ring from the shaft end and strike off the entire valve rocker gear from the shaft.

2.16 CYLINDER HEAD, VALVES AND SPRINGS

The cylinder head is a casting of special grey cast iron. The valve seats and guides are cast and machined directly in the head. The valves are of different diameters, the intake valves being larger. Outer (exhaust) ports are single, all remaining are doubled, i.e. bifurcated and branching to two valves in adjoining cylinders. The centre exhaust port branches to the cylinders No. 2 and 3, the neighbouring intake port to the cylinders No. 1 and 2, and No. 3 and 4. The cylinder head can be handled in the car as a unit. Of the individual jobs, only the replacement of valve springs, cotters, and cylinder head bolts can be carried out with the engine in position in the car. For all the remaining jobs, the cylinder head has to be removed from the car.

To remove the valve springs, screw out the sparking plugs and, using a tommy bar with a curved end (steel bar of about 5 mm diameter), brace the valve to prevent it from sliding down into the combustion chamber.

To Remove Cylinder Head from Engine

1. Let the engine cool down before removing the cylinder head to preclude warping of its bearing surface.

2. Drain the coolant into a clean vessel (see Chapter 15.13), detach all parts connecting the cylinder head to the vehicle, and remove all parts which are likely to obstruct the removal.

3. Remove the air cleaner, lift away the cylinder head cover, and remove the nuts and bolts holding down the cylinder head (on engines of Škoda 120 L and 120 LS cars, two bolts also hold down the end rocker shaft supports) reversing the order of the numbers indicated in Fig. 2.16/1. By pulling the exhaust manifold, disengage the cylinder head and lift it away.

To Refit Cylinder Head on Engine

1. Locate the cylinder head gasket on a perfectly clean surface of the cylinder block (clean

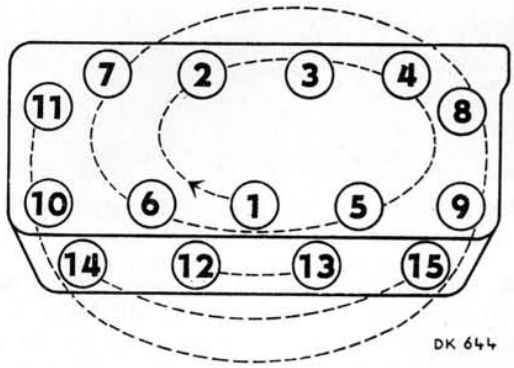


Fig. 2.16/1 - Tightening Diagram of Cylinder Head Bolts and Nuts
For tightening torques see Chapter 1.8

the cylinder head as well) and make sure that the oilway feeding oil to the rockers is not obstructed on the rear wall of the cylinder block.

Release the rocker ball pins (for valve clearance adjustment) and install the rocker on the head. If necessary, also loosen the fastening of the rocker-shaft supports.

2. Swing the rockers into the pushrods, screw down the bolts and nuts (see Chapter 2.3, paragraph 29) and tighten them lightly. Then apply the full tightening torque. For the preliminary as well as final tightening observe the sequence indicated in the illustration (Fig. 2.16/1). Retighten the slackened rocker-shaft supports and lock in position.

3. Adjust the valve clearance as per Chapter 2.13, refit the cylinder head cover, the air cleaner, reconnect all disconnected parts, and tighten all slackened joints.

Cylinder Head Disassembly

Disassemble and reassemble the cylinder head on a work bench. It is advisable to make a support in which to place the head so that it does not rest on the stud bolts when doing a job from the side of the combustion chamber. An example is shown in Fig. 2.16/7.

1. Remove the exhaust and intake manifolds, the casing of the thermostatic temperature control, and lift away the entire valve rocker gear after having unbolted the rocker-shaft supports.

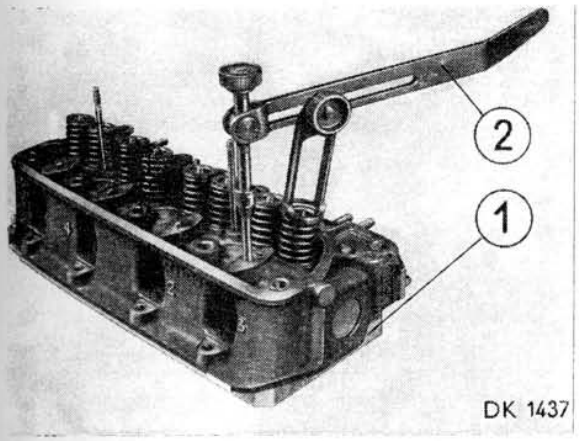


Fig. 2.16/2 - Refitting Valve Springs
For holding down the lever, use the auxiliary bolt M 8 screwed down in the hole for the rocker-shaft support and potruding some 55 mm from the head

1 - MP 1-113 valve supporting plate
2 - MP 1-114 valve fitting lever

2. Place the head on the supporting plate MP 1-113. Its projections protruding into the combustion chambers support the valves and prevent them from sliding down into the combustion chambers after releasing the spring.

3. Screw down the MP 1-114 lever on the bolt which previously held down the rocker-shaft support, and use it to compress the valve spring. Withdraw both valve cotter halves from the spring retaining plate.

Put the valves aside in their original order or mark them so as not to mix them up when refitting them in their guides.

Reassembly of Cylinder Head and Manifolds

1. Place the perfectly cleaned and repaired cylinder head into the support (see Fig. 2.16/7) with the combustion chambers on top. Remove carbon deposits with chemical agents (observing the pertinent instructions of their manufacturer) or using wire brushes, preferably of the disk type with a shank for clamping in a hand drill, or hand scrapers.

2. Install the valve in the valve guide. When refitting used valves, be sure to install them in their correct guides. Coat the valve seat with grinding paste (compound) and grind-in the valve head with the seat. After having ground-in the valves, remove them and put them aside in their original order or mark them for correct refitting; clean the valves and the cylinder head (with the ports) thoroughly. Matching the valves with their ground-in seats, refit them in the cylinder head and check for leakage (for grinding-in, testing, and repairs see the further paragraphs).

3. After the leakage test, place the cylinder head with fitted valves on the MP 1-113 support plate.

Since 1977 120 LS Single Valve Springs.

4. Slip springs with their retaining plates over the valves and screw down the MP 1-114 lever on the bolt. Using the lever, compress the springs and put two valve cotter halves in each retaining plate. Release the spring carefully while checking whether the cotter halves have correctly bedded on the valve. Having fitted all springs, remove the cylinder head from the support plate and check the spring retaining plates for correct locking by striking on the valve stems to open the valves.

5. Place the gasket on the cylinder head in the point of the oilway feeding oil to the rocker-shaft support. Insert the bolt with washer into the hole in the support (preferably with a drilled hole for oil supply), rotate the support slightly till the entire bolt length enters into the hole in the support, and bolt down the rocker shaft complete with rockers using bolts with washers and shims - see Chapter 2.3, paragraph 32.

The rocker-shaft support has a paper seal preventing leakage of the oil fed from the cylinder block to the rockers via the support. If a ready-made seal (gasket) is not available, make it yourself using paper 0.1 mm thick. A thicker seal is unpermissible as it would cause a distortion of the rocker shaft. The hole in the seal must coincide with the oil hole of the rocker.

Apply the seal and refit the exhaust and intake manifolds. For details see Chapter 2.3, paragraph 30.

6. Reinstall the thermostatic temperature control casing with its gasket and do not forget to put spring washers under the nuts.

Note: When reassembling the cylinder head of an engine removed from the car, it is advisable to proceed with the jobs as per paragraph 5 and 6 with the cylinder head refitted on the engine to facilitate the task.

If the cylinder head gasket has been replaced with a new one, invite the customer to bring in the car after travelling 500 to 1,000 kilometres for a retightening of the cylinder head and adjusting of the valve clearance.

3. To ensure a leakproof condition of the valves, grind them in with their seats in the cylinder head.

Valve Guides

The valve guides are formed directly by the cylinder head material. If reconditioning is necessary, rebore the guide hole and press-fit a bush.

Valve guide bushes are not available as spare parts. They can be made individually according to the following drawing. The required material is grey cast iron of 200 N/mm² (20 kp/mm²) tensile strength, in Czechoslovakia cast iron to specifications of the Czechoslovak Standard CSN 42 2421.

Having press-fitted the bush, correct any shrinkage of the inside diameter and, to match the new guides, recondition the valve seats and grind-in the valves.

Valve guide tolerances

Guide	7.94 - H8	± 0.022 0.00	mm
Inlet Valve	7.94 - F7	+ 0.028 + 0.013	mm
Exhaust Valve	7.94 - E7	+ 0.040 0.025	mm

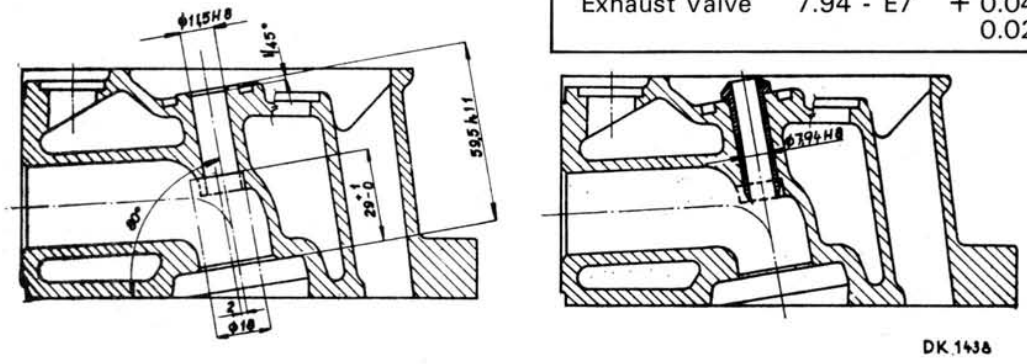


Fig. 2.16/3 - Reconditioning Cylinder Head for Fitting Valve Guide Bush

Sealing of Cylinder Head

As a separate unit or forming a unit with the cylinder block, the cylinder head must be sealed against leakage of gases and water, i.e. it must be gas- and watertight.

1. When replacing some of the bolts protruding into the water jacket, seal them with paint. The water jacket of the cylinder head must be leakproof when tested with water under a pressure of 0.5 MPa (5 kg/cm²).

2. If it is necessary to restore the flatness of the cylinder head mating surface, regrind the surface only to the least possible extent so as not to increase the engine compression ratio.

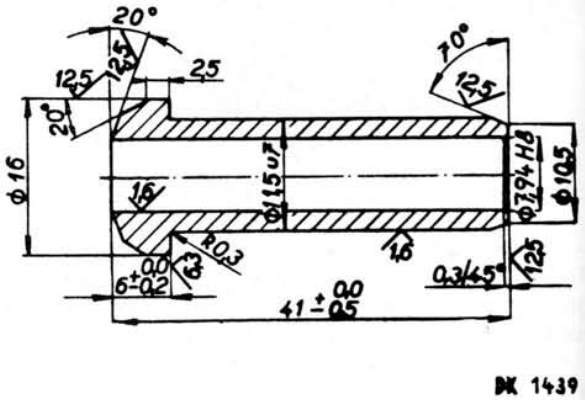


Fig. 2.16/4 - Valve Guide Bush

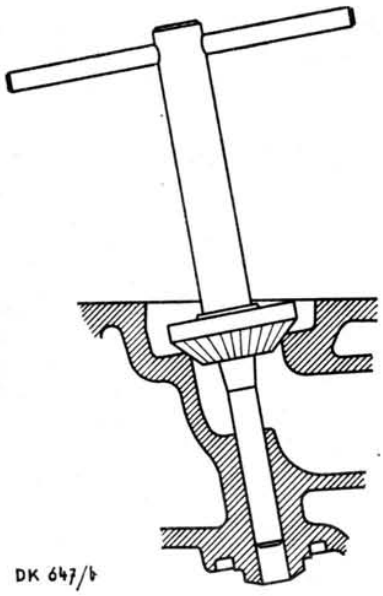


Fig. 2.16/5 - Milling Valve Seat - Milling Cutter Position

To Recondition Valve Seats and Grind-in Valves

These operations become necessary if the valves fail to pass the leakage test (see paragraph 3), if the seats are too wide, when fitting new valves, or after reconditioning valve guides.

Use a milling cutter for reconditioning the conical surface if the seat cannot be ground-in with its respective valve.

1. Check and repair the valve guides, if necessary, to ensure a correct guiding of the valves. Fit an angle cutter on an arbor, the shank of which corresponds to the valve diameter, and dress the valve seat. This dressing will result in widening the seat. Now, proceeding in accordance with Fig. 2.16/6, reduce the seat width using other milling cutters.

Check the diameter and width of the seat according to contact marks on the valve head. Coat the seat with marking paint and twist the valve in the seat to obtain contact marks. The traces of the seat must be reproduced in the centre of the conical surface of the valve.

2. Coat the seat or the conical surface of the valve with a fine grinding compound (mixture of oil with fine floated emery) and insert the valve into its guide. Press the valve against its seat and grind it in by turning it to and fro several times. Then move the valve round into another position and repeat this procedure all round the valve circumference. Now remove the valve and inspect it for the results of the grinding-in procedure. The mating faces of both the valve and the seat must be a uniform dull grey. Use a rubber vacuum cup for holding down the valve during grinding-in.

Thoroughly remove the grinding compound also from the ports in which it may have penetrated, and check the valve for leakage.

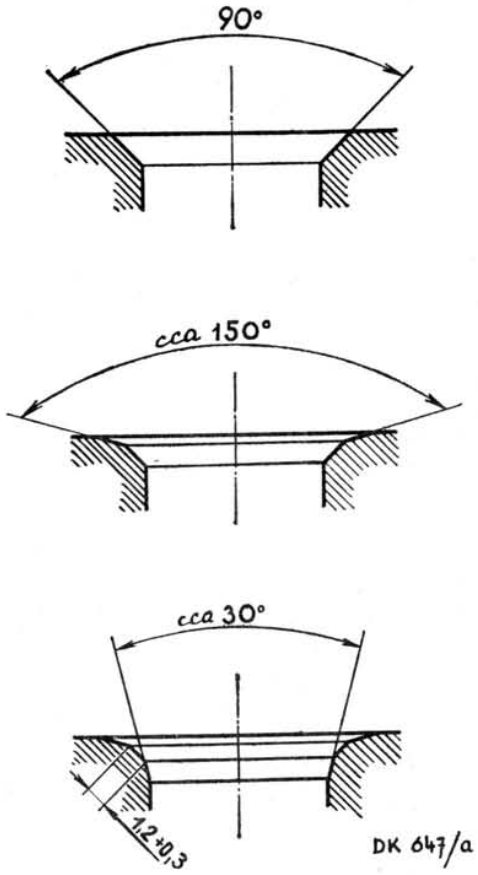


Fig. 2.16/6 - Reconditioning Valve Seat Using a Milling Cutter - Sequence of Operations

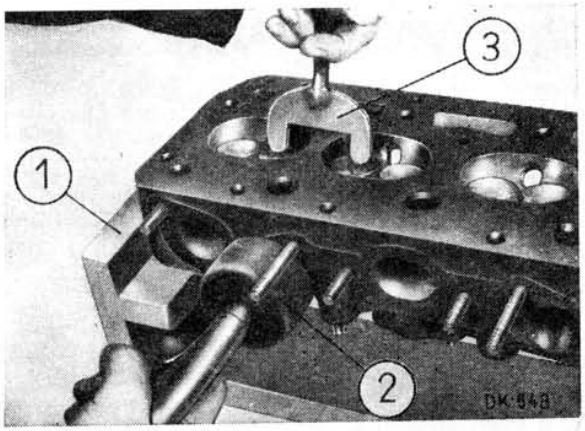


Fig. 2.16/7 - Valve Leakage Test with Compressed Air

1 - support, 2 - rubber end piece, 3 - press-down fork

3. The leakage test should be carried out with the cylinder head fully assembled by pouring a small quantity of petrol into the exhaust and intake ports. The petrol must not leak past the mating face of the valve in the combustion chamber. Another method involves pouring a small amount of thin oil into the combustion chamber and introducing compressed air into the exhaust and intake ports using, for example, a rubber cone. No air bubbles must appear around the valve heads.

This test can be simplified by omitting the fitting of valve springs while pressing the valves into their seats by hand using a suitable fixture (fork) for holding down the valves.

Valves

The valves are forgings of special high-temperature steel with a conical sealing surface and hardened stem end. The valve heads are of unequal diameters (larger with intake valves and smaller with exhaust valves).

Current reconditioning of the conical sealing surface is done by grinding-in with the respective seat. If a major repair is required, regrind the sealing surface of the valve head on a grinding machine to an angle of 91° ± 10', and then grind it in with the seat.

When regrinding the conical surface, it is absolutely essential to keep it in correct alignment with the valve stem.

Valve Springs

	105/120		120LS
	Outer	Inner	
Free Length	45.85	43.6	45.20
Wire Diameter	3.75	2.5	4.00
Mean Spring Diameter	26.75	18.5	26.5
Spring Pressure Installed length	Length 30mm 299-358N	Length 30mm 108-127N	Length 29mm 460N

2.17 OIL SUMP

A sheet oil sump is used on engines with a 68 mm cylinder bore. Use a rubber gasket when installing the oil sump on the engine.

Engines with a cylinder bore of 72 mm have a cast and ribbed oil sump. For its installation use its respective cork gasket. A sheet baffle is bolted over the bottom of the oil sump. Use bolts with spring washers to bolt it down.

Relation between oil sump, oil dipstick, and oil pump:

To the sheet oil sump appertains the dispstick of a total length of 305 mm (including its handle) and the short oil pump, to the cast oil sump the 330 mm long dipstick and the longer oil pump - see Chapter 2.18.

2.18 TIMING GEAR COVER - OIL PUMP

In addition to timing gears, the timing gear cover houses also the oil pump (forming its housing) and the distributor drive.

A general description of removing the timing gear cover from the engine can be found in Chapter 2.4 and for details, regarding its fitting on the engine, refer to Chapter 2.3, paragraphs 22 to 25.

The engine with the sheet oil sump has the shorter oil pump with the suction strainer holder 72 mm long. The engine with the cast oil sump has the pump 30 mm longer.

Assembling Oil Pump

Coat the pump gears and the drive gear shaft with oil, and install them into the timing gear cover. Insert the gasket and close the pump with the lid with suction pipe and strainer. Use spring washers to prevent the lid screws from slackening.

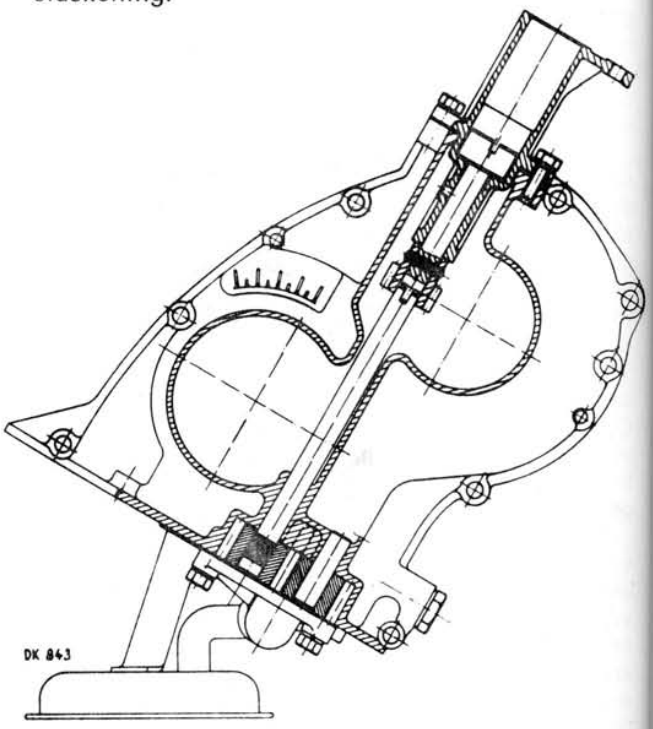


Fig. 2.18/1 - Timing Gear Cover Assembly - Sectional View

(for better illustration, the pinned connection of the shaft and gear is somewhat turned, its correct position being described in the text)

For egines with a sheet oil sump, the suction strainer with the lid is lower (the length of the bracket measured in its centre part is some 65 mm), for engines with cast oil sumps higher (the length of the bracket being 105 mm approximately).

The gasket under the lid of the pump gears provides for the required axial clearance of the gears. If it has to be replaced and no genuine gasket is available, make it from paper not thicker than 0.1 mm.

To preclude a loss of oil pressure due to abnormal leakage of the pump in service, the respective clearances must be kept within the limits specified in the following Table:

Clearance	Running clearance mm	Maximum wear mm
Between drive shaft and its bearing	0.06 0.02	0.15
Between pin and driven gear	0.050 0.014	0.10
Axial clearance between pump gears and lid	0.158 0.045	0.2

Seal

Fit the seal of the front face bore with its tightening fin turned inside the cover and so that it protrudes about 2 mm below the inside edge of the bore.

Assembling Distributor Bracket

1. Thread the shaft into the distributor bracket, slip on the worm gear with the teeth pointing outwards from the bracket, and, using a dia. 4 drill, drill together the gear and shaft in the predrilled holes. Insert a pin into the bore (pin dia. 4×20) and clinch it to secure the pinned connection.

When drilling the gear and shaft together be sure that the axis of the bores in the gear is in line with the axis of the shaft head slot. It is important for any further adjustment of the ignition distributor.

To prevent the adjusted position from changing during drilling, it is advisable to make a pilot mandrel to be inserted into the bracket. Then compress the thus prepared assembly using a suitable fixture.

2. After pinning, tap on the drive shaft to ensure the minimum axial clearance (about 0.1 mm) between the gear and the shaft.

3. Fit the bracket complete with its gasket into the timing gear cover using spring washers under the screw heads.

2.19 CARBURETTOR

Technical Description

The carburettor is of the down-draught type consisting of two stages. Stage I for the basic engine run is controlled by the accelerator pedal, stage II is controlled automatically by underpressure (vacuum) according to the engine loading. At idling speed, the carbon monoxide content is adjustable to the recommended limits.

The same carburettor types are used for the individual car models, they have only different adjustments specified in the following survey.

FUNCTION OF CARBURETTOR SYSTEMS AND SURVEY OF FUNCTIONAL PARTS

Stage I

This stage ensures the supply of an adequately rich mixture for idling, acceleration, and a great part of the engine loading as well as the enriching of the mixture for full engine load.

Stage II (Fig. 2.19/4)

This stage consists of the main system for higher engine loading, a by-pass system, and a system of auxiliary idle run. It starts operating after the throttle valve of stage I has opened through 43 degrees, in which position it is mechanically unlocked and further controlled by the diaphragm actuated by underpressure supplied by air jets from the narrowest parts of the atomizer cones of both stages.

Float Chamber (Figs. 2.19/1 and 2.19/5)

Fuel supplied through the cover passes through the fuel strainer and the needle valve into the float chamber. Here its level is maintained at the same height by the float which closes the needle valve when the specified level is attained. Air escapes from the float chamber through the respective hole in the cover under the air cleaner. After the closing of the throttle disk of stage I, a leverage opens the air-venting valve and air escapes from the float chamber into the atmosphere. At the opening of the throttle disk of stage I through 15 degrees, the air-venting valve closes and the float chamber is again vented through the hole under the air cleaner.

Technical Description

Car Model	Carburettor type and model 1976/1979	1979 onwards*
105 S and 105 L	JIKOV 32 EDSR - 443 751 290 100	JIKOV 32 EDSR - 443 751 292 400
120 L	JIKOV 32 EDSR - 443 751 319 800	JIKOV 32 EDSR - 443 751 292 500
120 LS	JIKOV 32 EDSR - 443 751 290 000	JIKOV 32 EDSR - 443 751 292 600

Types of carburettors and their functional elements according to the Solex comparison table or according to their bore (in millimetres)

Car model	105 S, 105 L		120 L		120 LS	
Carburettor type and model	See above					
Elements of stage I and II or in common	stage					
	1	2	1	2	1	2
Atomizer cone diameter	21	22	22	23	22	23
Main petrol jet	105	120	112/110*	125	112/110*	130/125*
Main air jet	170	160	170	160	170	160
Pilot jet	50	45	50	45	50	45
Pilot air jet	140	—	140	—	140	—
Auxiliary pilot jet	—	60	—	60	—	60
Econostat petrol jet	60	—	60	—	70	—
Econostat mixture jet	95/85*	—	110	—	110	—
Econostat air jet	70	—	70	—	70	—
Choke petrol jet	90		100/90*		100/90*	
Choke air jet diameter	4.5/5.5*		4.5/5.5*		4.5/5.5*	
Diaphragm control air valve	130	80	160	80	160	80
Pump by-pass orifice	40/45*		40/45*		40/45*	
Injector	50	—	50	—	50	—
Needle valve diameter	1.5		1.5		1.5	
Suction connection diameter	1.2		1.2		1.2	
Acceleration pump discharge	7 to 9 c.c. per 10 strokes (1976-79) 6 to 8 (1979 onwards)					
Float weight 20 ± 1 gram	Fuel level. Float Removed. 28mm ± 1mm from top face					

Main System (Fig. 2.19/1)

Both mixing chambers have self-contained main systems. Air is mixed with petrol in the emulsion tube and the final adjustment of the mixture takes place while it is carried off by the air flow with the throttle disc open.

Idle Run and By-pass System (Fig. 2.19/2)

These are taken care of by two circuits — by the idle run system in stage I and the auxiliary air system in stage II. Both systems are connected to the main systems of both stages in the zone of the emulsion orifice by the respective elements terminated by the adjustable idling screw and fast-idling (auxiliary air) screw.

Stage I incorporates the petrol jet separator for the prevention of self-ignition. The idling orifice is interconnected with the mixing chamber by two by-pass bolts enabling a smooth transition to the main system, and a hole is provided in the mixing chamber to obviate any interference with the smooth flow at a higher underpressure (vacuum).

In stage II, the by-pass hole enhances a smooth and continuous interconnection of both carburettor stages.

Econostat or rich-mixture system (Fig. 2.19/3)

This system enriches the mixture in stage I at higher engine load (output). It operates automatically according to the value of underpressure in the atomizer and in dependence on the flow of air sucked-in by the engine.

Acceleration pump (Fig. 2.19/5)

This is a mechanical, diaphragm-type pump controlled by the throttle disc of stage I. Fuel sucked-in by the diaphragm from the float chamber passes through a non-return ball valve to the injector and through the by-pass orifice back into the float chamber. At a sudden opening of the throttle disc, the major part of the fuel pases through the injector, at a slow opening into the by-pass without the action of the injector.

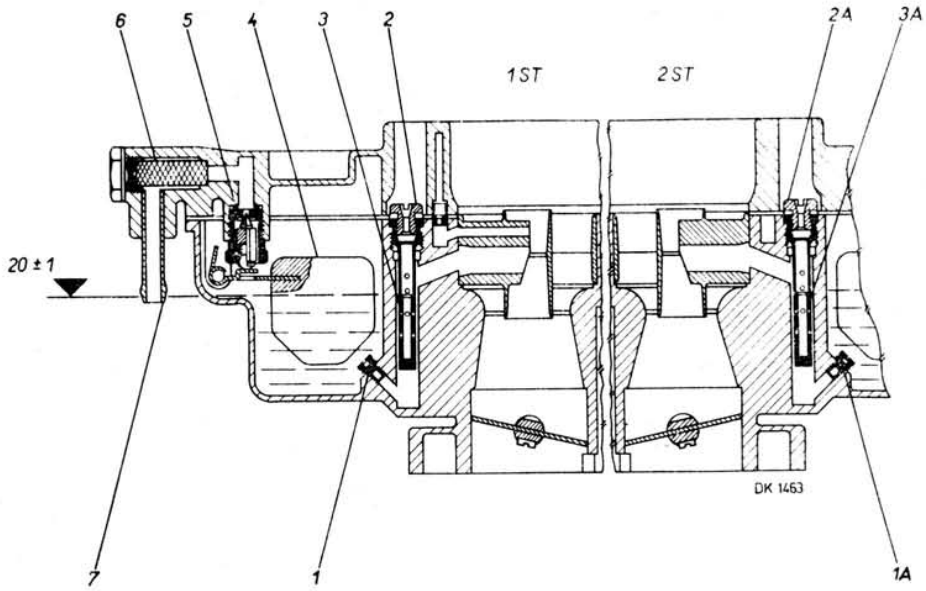


Fig. 2.19/1 - Main System and Float Chamber

1 - Main petrol jet of stage I, 1A - Main petrol jet of stage II, 2 - Main air jet of stage I, 2A - Main air jet of stage II, 3 - Emulsion tube of stage I, 3A - Emulsion tube of stage II, 4 - Float, 5 - Needle valve, 6 - Fuel strainer, 7 - Fuel inlet connection, 20 ± 1 = height of fuel level under the lower plane of the cover, 1 St and 2 St - Carburettor stage I and II

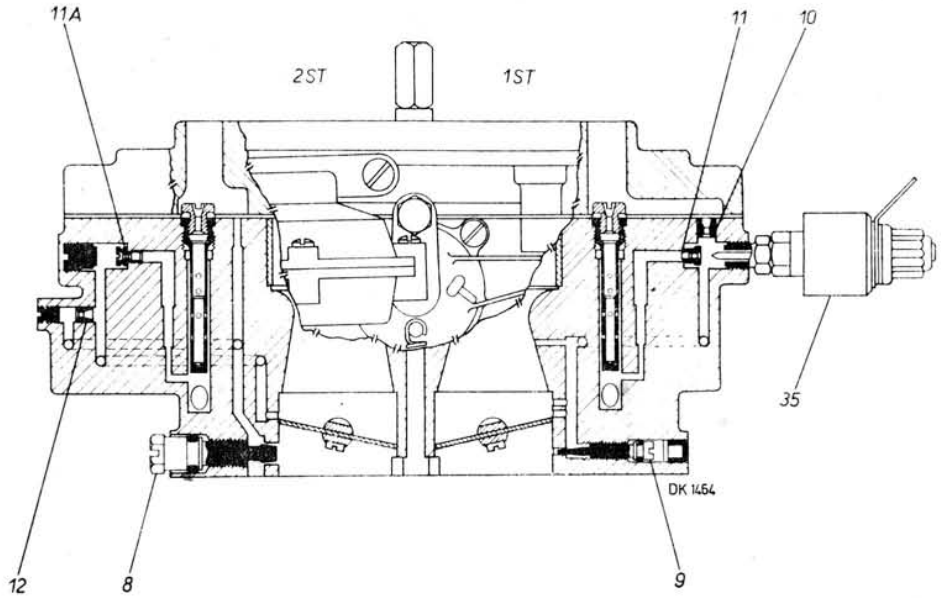


Fig. 2.19/2 - Idle Run System

8 - Air-correction screw, 9 - Rich-mixture regulating screw - fast-idling correction screw, 10 - Pilot air jet, 11 - Pilot jet of stage I, 11A - Pilot jet of stage II, 35 - Pilot jet (11) separator, 1 ST and 2ST - Carburettor stage I and II

Choke — Cold-starting Device (Fig. 2.19/6)

Basically, the choke is a self-contained carburettor consisting of a fuel reservoir, a petrol jet, an air jet, a vacuum controller, and a throttle valve. The mixture is formed in the throttle valve zone where it is sucked out from under the carburettor throttle disc.

At increasing engine speed, the rising vacuum moves the plunger of the choke vacuum control, the holes in the plunger overlap and thus the mixture is enriched automatically. The driver controls the richness of the mixture by opening or closing the choke throttle valve.

Auxiliary Devices

Vacuum connection for the vacuum advance control picks up vacuum (the underpressure) above the throttling disc of stage I (see Fig. 2.19/4).

The suction connection is led out of the carburettor lower flange as a tube from under the throttle disc of stage II. The suction prevents a generation of vacuum (underpressure) in the crankcase during idle run and it removes for burning any residues of unburnt hydrocarbons which have got into the crankcase.

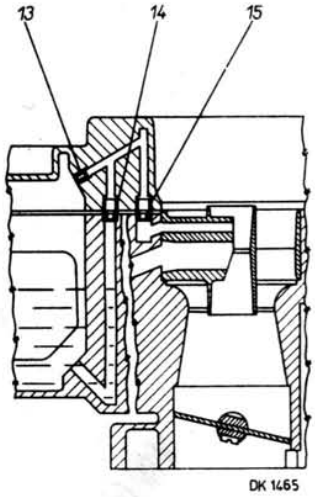


Fig. 2.19/3 - Econostat - Rich-mixture System

13 - Econostat air jet, 14 - Econostat petrol jet, 15 - Econostat mixture jet "2"

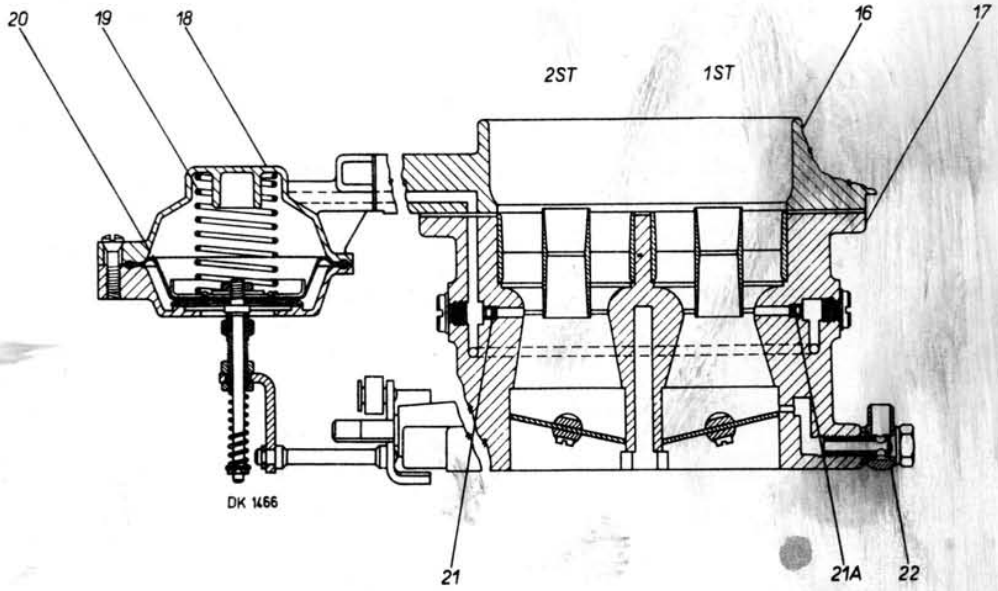


Fig. 2.19/4 - Stage I Control Elements

16 - Float chamber cover, 17 - Float chamber body, 18 - Stage II control, complete, 19 - Diaphragm spring, 20 - Diaphragm, 21 - Diaphragm control air valve - stage II, 21A - Diaphragm control air valve - stage I, 22 - Vacuum connection, 1ST and 2ST - Carburettor stage I and II

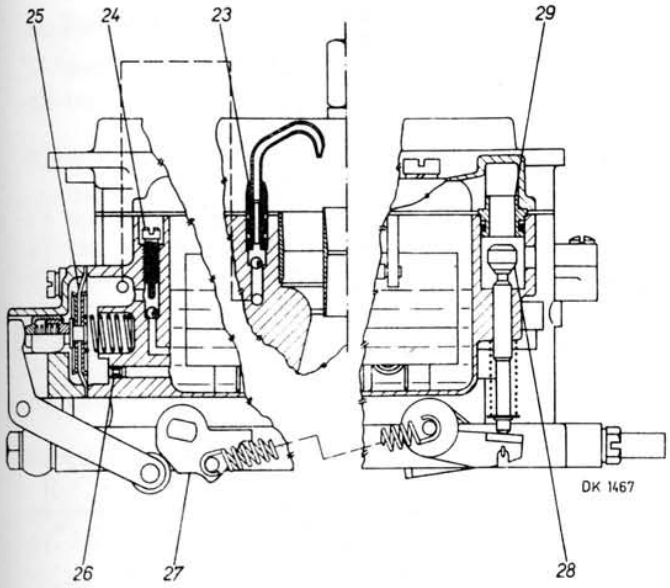


Fig. 2.19/5 - Acceleration Pump and Float Chamber Air Venting

23 - Injector, 24 - Stop screw, 25 - Acceleration pump, complete, 26 - Pump by-pass orifice, 27 - Acceleration pump actuating cam, 28 - Air-venting valve, 29 - Valve seat

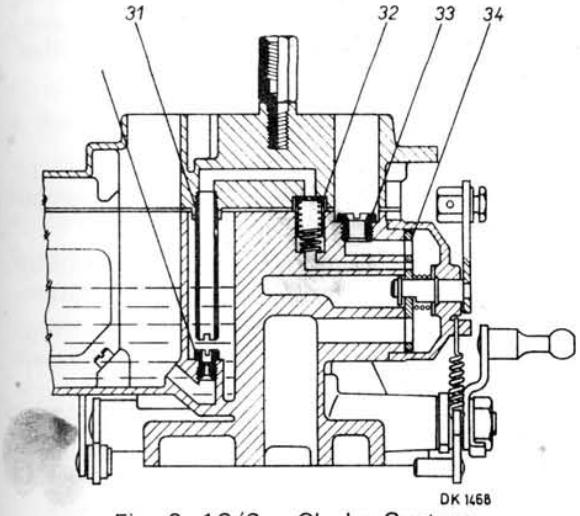


Fig. 2. 19/6 – Choke System
32 and 33 Items deleted since October 1979

30 - Choke jet, 31 - Choke pipe (in cover), 32 - Choke valve, 33 - Choke air jet, 34 - Throttle valve

CARBURETTOR DISASSEMBLY AND REASSEMBLY

Diagnostic equipment is required for a correct checking of carburettor parts and their reassembly. Such equipment can be found only in specialized service stations and repair shops, to which this equipment has been delivered together with pertinent instruction sby the carburettor manufacturer (MOTOR National Corporation, České Budějovice) or by the MOTOKOV Foreign Trade Corporation, Praha.

MAINTENANCE AND ADJUSTMENT OF FUNCTIONAL SYSTEMS

Maintenance

a) Routine maintenance, i. e. cleaning of the fuel strainer, idle run adjusting, and basic adjustment of idle run, is described in Chapter 15.3.

b) A detailed inspection and individual checks should include jobs described in the following subsections, and they should be always concluded by the basic idle run adjustment (Chapter 15.3).

Before handling the carburettor, clean its surface with petrol and blow off with compressed air. The same applies to functional elements inside the carburettor. Coat the friction areas of levers and similar parts with a lubricating compound on the basis of molybdenum disulphide to ensure their smooth movement.

Leakproofness of Needle Valve

The valve must maintain an underpressure of 0.048 MPa (0.49 kg/cm²). A permissible deviation of the measuring instrument is 0.0049 MPa (0.05 kg/cm²) per 5 seconds. During measuring, the fuel strainer in the inlet must be perfectly clean or removed. Replace a leaking valve with a new one. For removal of the carburettor cover refer to the following paragraph.

Never forget to adjust the fuel level - the float - after a replacement of the needle valve.

Replacement of Cover Gasket

Remove the controls of the carburettor stage II from the cover and lift away the cover. Be careful to remove the cover together with the gasket, otherwise the gasket is apt to snap. Lift away the float from the cover after having pushed out its hinge pin. Now the needle valve is accessible.

To Adjust Fuel Level

First remove the cover according to the previous instruction and then adjust the float. Place the cover vertically. The clearance between the lip of the float and the gasket must be 10 mm (it is recommended to insert a rod of

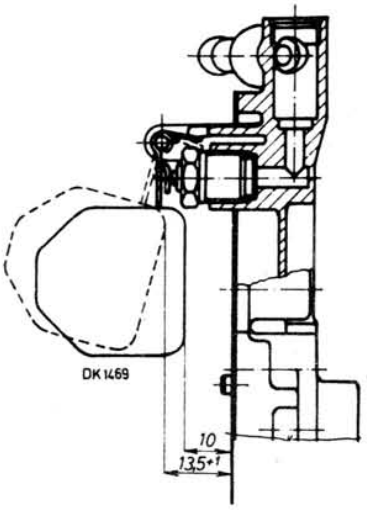


Fig. 2.19/7 - Float Adjusting by Bending the Lip of the Float Hanger

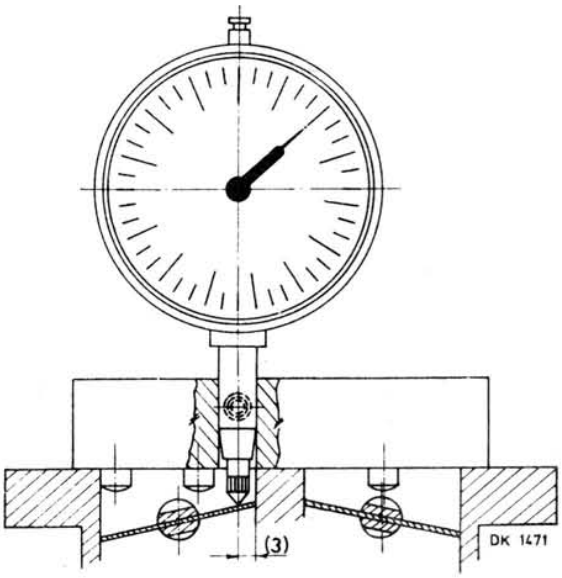


Fig. 2.19/8 - Adjusting Throttle Discs Using MP 1-120 Indicator

10 mm in diameter between the gasket and the float). The lip must lightly touch the spring-loaded ball in the needle valve. The lip must not press - in the ball or move away from it.

The dashed lines show the float in its lower position.

Petrol and Air Jets

Clean them by swilling in petrol and blowing though with compressed air. When removing them, note their location to facilitate reinstallation in their proper places.

Volume Injected by Acceleration Pump and Pump Handling

Fill the carburettor with fuel and operate the carburettor lever 10 times through its full stroke to injet fuel. Operate the lever at intervals of 3 to 4 seconds and catch the fuel into a graduated vessel. The injected amount should be 7 to 9. c. c. If necessary, deflect the injector so that the jet of fuel passes directly through the chamber and does not flow down its walls.

When refitting the acceleration pump cover, preload the diaphragm by opening the throttle disk of stage I to its full stroke before retightening the cover capscrews.

To Adjust Throttle Discs

Turn over the carburettor with the throttle discs on top and loosen the regulating screws in the flange till the throttle discs are fully closed. Place the indicator MP 1-128 on the flange near one of the throttle discs and force it down till the pointer of the dial indicator touches the disc. Zero the scale and rotate the regulating (adjusting) screw while forcing down the indicator till the throttle disc partially opens (3 mm from the edge of the throttle disc) and the indicator reads 0.10 to 0.12 mm. Proceed in the same way to adjust the other throttle disc.

Setting Idle Run Adjusting Screws

After a dismantling, etc., set the screws in their basic positions so that the engine can be started up and be kept running.

a) Rotate the air correction screw (Fig. 14.3/9) four times through 180° to closed position.

b) Rotate the idle run adjusting screw (Fig. 15.3/10) five times through 180° to closed position.

Do not tighten the screws forcefully in their closed positions. They must bear against their seats just lightly so as not to foul them.

Testing the Operation of Pilot Jet Separator

The pilot jet operates correctly if switching on and off of the current fed to the separator (by switching on the ignition, etc.) is manifested by audible clicks. The separator closes the pilot jet when the current is switched off (switched off ignition).

Carburettor Defects and Their Removal

Notice: Turn your attention to the carburettor after having ascertained that the engine, fuel supply, and ignition operate correctly.

1. Excessive Fuel Consumption

– overflooding of carburettor	
a) leaky needle valve	– check for leakage, clean, or replace with a new one
b) too high fuel level	– adjust the float
– incorrect sizes of jets	
c) too large main jets	– check and replace with correct ones
d) too small (clogged) main air jets	– clean them
e) air-venting valve does not close (sticks)	– unstick it or replace with a new one (including its seat)

2. Incorrect idling

– engine does not idle	
a) choked pilot jets	– clean and check them, and replace them with new ones if necessary
b) choked orifices of idle run	– blow through the orifices with compressed air
c) incorrectly adjusted fast-idling screw	– adjust correctly
d) defective separator (needle closes the jet)	– replace the separator with a new one*)
– erratic idle run	
e) partially choked jets or incorrect jet sizes	– clean and check the jets, or replace them with new ones
f) false air is sucked-in	– inspect and replace the gasket under the flange, if necessary, true up the contact area of the flange
g) incorrectly adjusted idle run	– adjust correctly
h) too low idling speed	– raise idling speed to the specified value

3. Incorrect by-passes of stage I or II

a) incorrectly adjusted idle run	– adjust correctly
b) incorrect or defective carburettor parts	– install correct parts, clean them, or replace them with new ones
c) choked by-pass orifices	– clean the orifices with compressed air

4. Poor acceleration

a) choked injector	– inspect it and clean its orifice
b) leaky non-return valve of acceleration pump	– clean it or replace if necessary
c) defective diaphragm	– replace with a new one

5. Loss of power

– stage I does not open	
a) choked diaphragm control air valves	– clean them
b) damaged diaphragm of stage II control	– replace control elements of stage II with new ones
c) incorrectly adjusted throttle disc of stage II	– adjust the throttle disc
– stage II opens but power is inadequate	
d) mutually interchanged elements of stage I and II in both stages or defective elements	– install correct elements

6. Engine will not start

– starting cold engine	
a) choked or incorrect choke jet	– clean the jet or replace it with a new one
b) low fuel level in float chamber	– adjust the float
c) incorrectly adjusted idle run (excessively opened throttle disc)	– adjust correctly idle run

*) If no new separator is available, remove its needle and reinstall it. When removing the needle, hold the separator by the double nut and screw off the needle closing nut. Protect the disconnected cable against a short-circuit. This procedure should be, however, considered as an emergency and temporary measure.

d) choke plunger sticking in its bottom position — unstick the plunger or replace it with a new one
— starting warm engine
e) too high fuel level in float chamber — adjust the float
f) incorrectly adjusted idle run — adjust idle run correctly

2.20 FUEL PUMP

Technical Description

The model JIKOV MF 3407 fuel pump is of the diaphragm and lever type, controlled by the round disc of the camshaft. The suction motion of the diaphragm is actuated by the lever, the discharge motion by the spring of the diaphragm. Fuel flows through a strainer, a mud trap, and the suction valve to the delivery valve. A priming lever is provided for hand priming of the fuel. The moving mechanism is lubricated with oil splashed from the cylinder block.

Stroke of the driving disk	4 mm
Suction head	1.5 mm
Delivery head	2 mm
Pump discharge at 2,000 strokes per minute and free outflow without counter-pressure	30 ltrs/hr.

Maintenance, Repairs, Disassembly and Reassembly

For routine maintenance (cleaning of the mud-trap screen) see Chapter 15.3. After having operated the hand-priming lever lift it till it engages safely in its locked position.

In the case of a defect, inspect the diaphragm and check the valves for leakage. After having removed the pump from the engine, remove the mud trap, separate the upper part from the lower part, and remove two screws, holding down the thrust plate, to lift away the valves. Swill all parts in petrol and blow off with compressed air. Replace damaged parts with new ones.

If necessary, remove the diaphragm from the actuating lever in the lower part of the fuel pump (its manufacturer recommends the diaphragm to be replaced after about 50,000 kilometres with a new one). Do not stretch the spring of the diaphragm and do not alter its compression force characteristic in any way.

Do not forget to put fibre packing rings under the valves when reassembling the fuel pump. Put a spacer ring under the suction valve (close to the mud trap). Fig. 2.20/1 shows the positions of valves and the holding-down thrust plate.

Put the spring of the diaphragm into the lower part of the pump and engage the pin of the diaphragm with the actuating lever. Operate the hand lever to compress the diaphragm and hold it in position by inserting a rod of 4.5 to 5 mm diameter (for example the shank of a drill, etc.) between the actuating lever and the wall of the pump lower part.

Now bolt both pump parts together so that the mud trap is on the right-hand side when viewing the pump from above and the fastening flange from the front. Use spring washers under the clamping bolts.

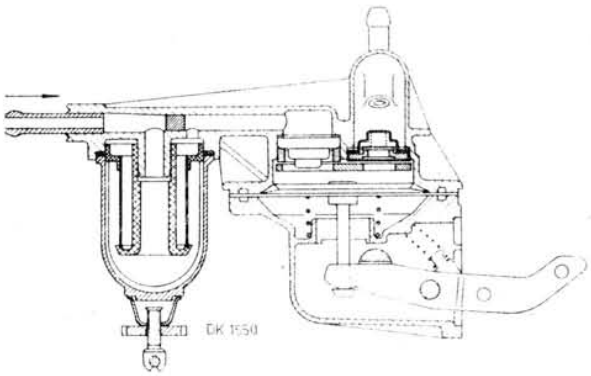


Fig. 2.20/1 - Section Through Fuel Pump

If it is necessary to verify the discharge of the pump by a test, note the following requirements which the pump must meet at 180 strokes per minute:

a) 15 ltrs/hr. at free outflow without fuel counterpressure
b) minimum pressure of 0.018 MPa (1.8 m of water column) at a zero off-take of fuel
c) a dry pump must draw fuel from a depth of 1.5 m in 16 seconds.

Fuel Pump Defects and Their Removal

1. Faulty fuel supply
a) clogged mud trap — clean it
b) damaged diaphragm — replace it with a new one
2. Fuel pump does not hold fuel
a) dirty or defective valves — wash them in petrol, replace defective valves with new ones

3 - CLUTCH

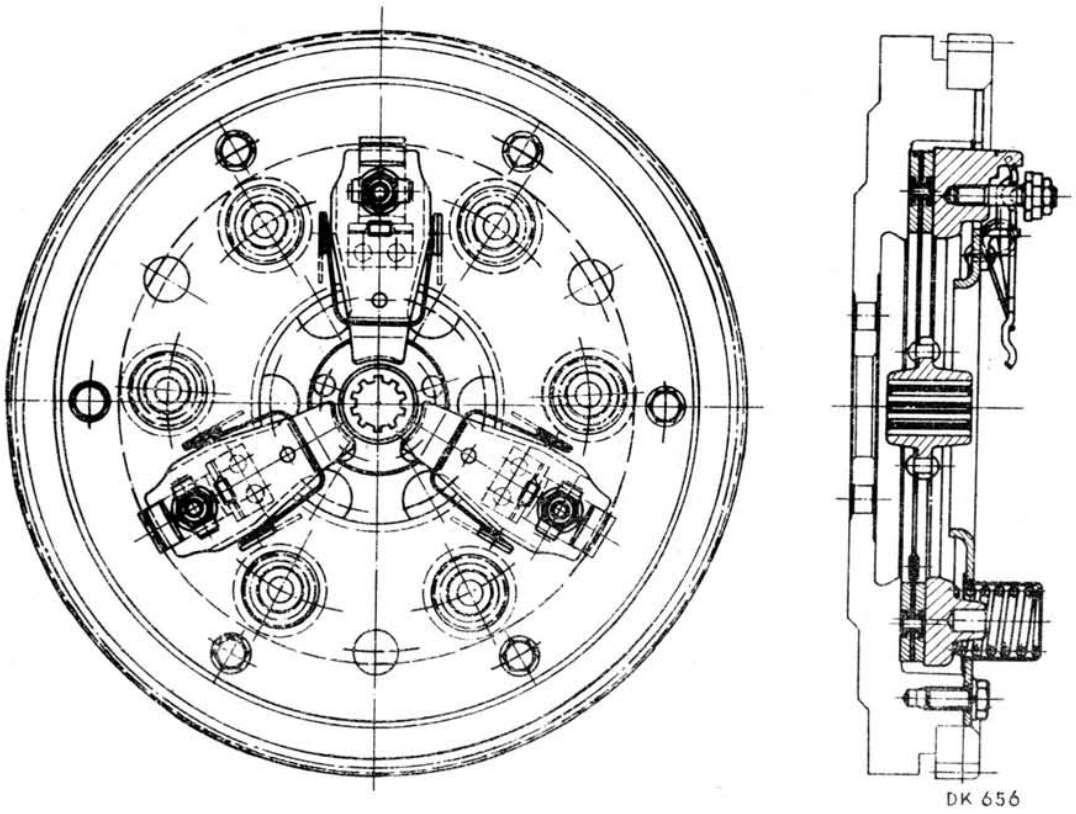


Fig. 3/1 - Clutch - Sectional View

Alternative Diaphram Clutch available, use Center Plate, Bearing and arm of LP type.

The clutch is a dry, friction, single-plate spring unit with riveted - on friction facing. The total friction area is approximately 270 cm². The clutch is operated hydraulically.

3.1 REMOVING CLUTCH FROM ENGINE

First disconnect the engine from the transmission gear to gain access to the clutch.

1. Provide centre marks on the clutch cover and the flywheel gear ring to mark the relative position of the clutch and flywheel (the engine and clutch forming a unit, the clutch has to be reassembled with the flywheel in the same original position).

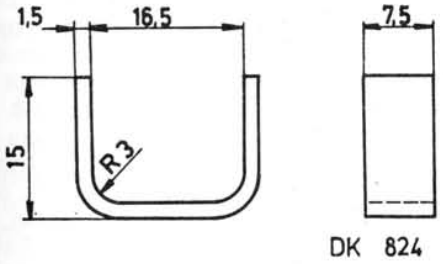


Fig. 3.1/1 - Support Clip for Clutch Release Levers

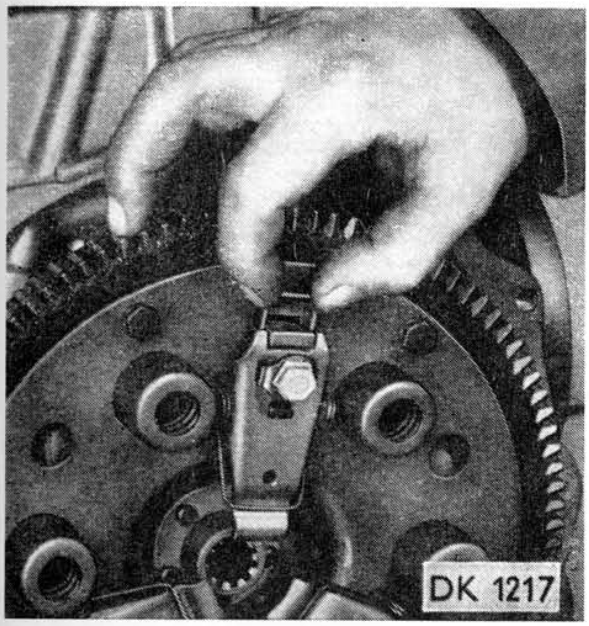


Fig. 3.1/2 - Relieving Clutch Spring Tension by slipping support clips under release levers

2. Slip support clips under the clutch release levers as shown in Figs. 3.1/1 and 3.1/2 and remove the flywheel fastening bolts. For the function of the supporting clips see Chapter 3.4, paragraph 3.

3.2 REFITTING CLUTCH IN ENGINE

If the engine has been in operation for a length of time, take the opportunity when removing the flywheel to add grease into the bearing in the crankshaft. Force grease into the bearing from the rear side, i. e. from the side of the cavity behind the bearing in the shaft.

1. Thread the MP 2-102 centering arbor through the clutch, fit the friction plate on it with the shorter part of the splined hub for the flywheel engaging into the bearing in the crankshaft, and centre the clutch in the flywheel gear ring - see Fig. 3.2/1. Turn the clutch to align the centre marks provided on the clutch cover and the flywheel before the clutch removal. A new or any other clutch can be installed in any arbitrary position.

Use spring washers under the bolts.

2. Withdraw the supporting clips from under the clutch release levers and put them aside for future use.

3. If the assembly plate MP 2-109 has not been used for the assembly of the clutch and if the clutch has not been adjusted, or if a used friction plate has been fitted (see Chapter 3.5), adjust the planeness and travel of the release levers.

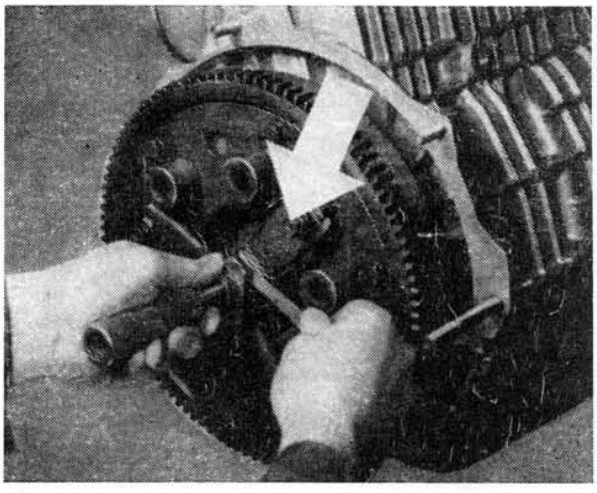


Fig. 3.2/1 - Checking Adjustment of Clutch Release Levers Using Checking and Centering Fixture

Turn the flange on the centering arbor so that the longer, cylindrical part faces the clutch, push it against the friction plate hub, and align the ends of the levers to touch the flange. A deviation from the planeness of 0.1 mm is permissible. Use feeler gauges for checking this deviation.

If it is not possible to adjust the out-travel of the clutch release levers to a value given by the length of the flange cylindrical part due to excessive wear of the friction plate, adjust to the next higher value. Clinch nuts on the adjusting nuts backed off up to the end of the thread are a warning of a wear limit which precludes any further adjustment of the clutch.

4. After having reassembled the engine with a new or adjusted clutch, check and, if necessary, adjust the clearance between the release levers and the throw-out bearing - see Chapter 15.4.

3.3 CLUTCH DISMANTLING

Owing to its simplicity, it is not necessary to describe in detail the dismantling of the clutch, but some special features deserve attention.

1. If the friction plate and clutch cover are intended to be re-used, mark their relative positions using centre punch marks to preserve the original balance of the assembly.

2. To dismantle the clutch, it is necessary to compress the clutch cover to relieve the stress of the release lever bolts. For this purpose use the MP 2-101 assembly plate shown in Fig. 3.4/1. After screwing off the release lever nuts and compressing the clutch cover, the clutch is ready for dismantling.

3.4 CLUTCH REASSEMBLY

1. Locate the clutch pressure plate on the MP 2-101 assembly plate and fit springs on the cylindrical bosses. Before fitting the springs, it is advisable to check them for compliance with the values specified in the following Table.

Table of Clutch Springs

Length of spring in mm		Load in N (kp)
Free length, approx.	47.5	0
Mounted length	31.5	510±36 (52±3.6)
Length of compressed spring	29.5	580 (59)

2. Install retaining plates on the clutch springs and fit the clutch cover with release lever springs in position. Assemble the clutch cover with the pressure plate, observing the marks indicating their relative positions. When assembling new parts, their positions are of no consequence.

3. Slip a 4.5 mm high pad over the assembly plate bolts (the plate can be used for Škoda 1000 MB and Škoda 100 cars as well, and by using pads of different heights, the plate can be adapted for different types of clutches), fit the yoke of the jig on the plate bolt and compress it by screwing down the nut till the bottom part rests on the pad. When compressing the clutch cover take care that the projections of the pressure plate are correctly centered in the cover slots to prevent a distortion of the clutch cover.

4. Slip the bottom ends of the release levers under the springs installed in the cover and fit them with their longitudinal slots on the supports. Slip adjusting washers on the bolts of the pressure plate and screw down the nuts with their cylindrical part facing the washers. Then adjust the height of the release levers with these nuts so that their ends touch the shoulder of the yoke bottom part. The difference of the lever height should not exceed 0.1 mm. This adjustment also sets the recommended distance of the levers from the pressure plate bearing surface.

Use clinch nuts for locking the adjusting nuts in position, put supporting clips under the release lever ends as shown in Fig. 3.1/1 and 3.2/2, and slacken the nuts of the assembly plate. The clips are useful when fitting the clutch to the flywheel since it is not necessary to overcome the tension of the clutch springs.

To Check Adjustment and Balance

The described adjustment of the release levers in the jig is the most accurate, the assembly

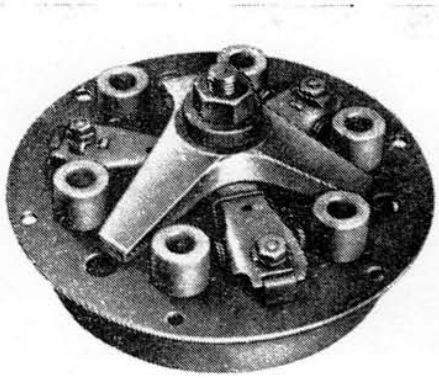


Fig. 3.4/1 - MP 2-101 Assembly Plate with Clutch

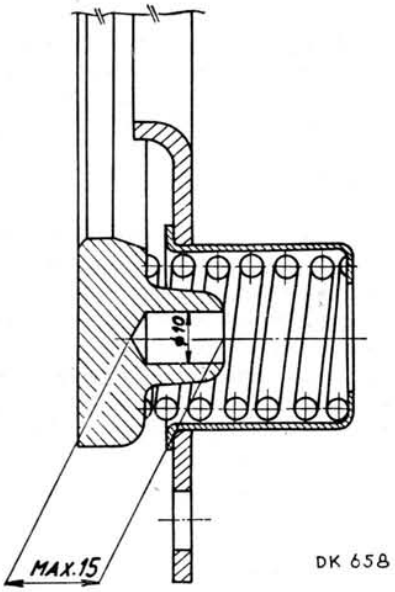


Fig. 3.4/2 - Clutch Balancing - Maximum Dimensions of Bores in Pressure Plate

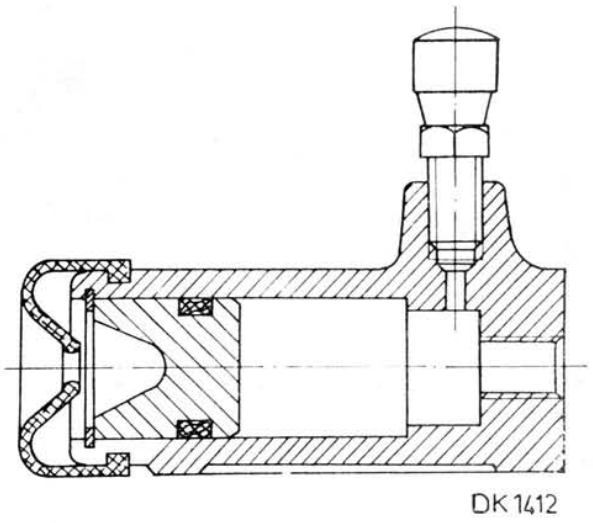


Fig. 3.6/1 - Clutch Slave Cylinder - Sectional View

plate being used as an "ideal clutch plate" simulating a new or slightly worn friction plate.

For another adjusting method see Chapter 3.2, paragraph 3.

The clutch is a unit balanced to 20 gcm with the exception of the separately balanced friction plate. Therefore, after replacing some parts of the clutch (plate, cover), recheck the clutch and balance it anew, if necessary.

To balance the clutch, drill holes in the centering bosses of the thrust springs of the pressure plate while not forgetting to remove the chips from the bores.

If these bores prove insufficient for correct balancing, remove an additional mass by drilling holes of 6 mm diameter in the clutch cover in a circle of 205 mm in diameter with at least 4 mm of material left between them, and 6 mm between them and the holes for the cover fastening bolts.

3.5 FRICTION PLATE

If the friction plate is worn down to 7 mm, it is advisable to replace it with a new one, 8.5 mm thick.

When worn to the said thickness of 7 mm, the friction plate is near complete deterioration and only a timely repacement will save a rather complicated work later on.

After having riveted on a new facing, check the plate for eccentric running and adjust it, if necessary, to 0.5 mm per dia. 170 mm. Also rechecking of the friction plate balance is required.

An out-of-balance of maximum 5 gcm is permissible. If necessary, balance the friction plate by grinding it along its circumference in a uniform arc to a depth of 2 mm, while taking care that no burrs are formed which would locally increase the thickness of the plate and thus unfavourably affect the operation of the clutch.

3.6 CLUTCH CONTROL MECHANISM

Throw-out bush with lever bearing and slave cylinder

The function of these parts is described in the section dealing with transmission gear. For their assembly see Chapter 4.3, paragraphs 29 to 32.

Throw-out Bush - Its assembly consists of press-fitting the special ball bearings and inserting the felt insert into the lubricating well. Soak the felt insert in hot oil and press-fit the bearing packed with the recommended grease so that its revolving race is turned outside (out of the bush).

Slave Cylinder - Its assembly can be seen in Fig. 3.6/1. For its fitting (lubrication of its parts with the brake fluid, etc.) observe the same principles as those applied to brakes.

Master Cylinder - Its assembly is apparent from the illustration. For its fitting (lubrication of its parts with the brake fluid, etc.) observe the same principles as those applied to brakes.

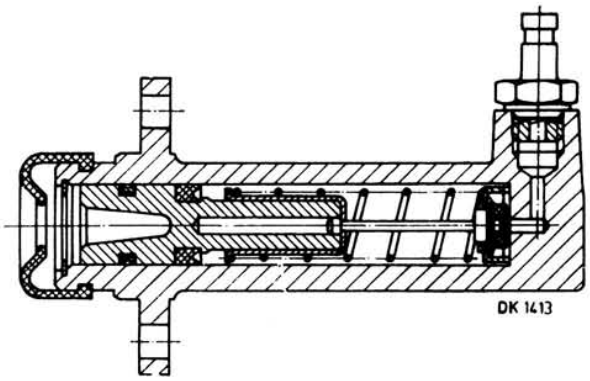


Fig. 3.6/2 - Clutch Master Cylinder - Sectional View

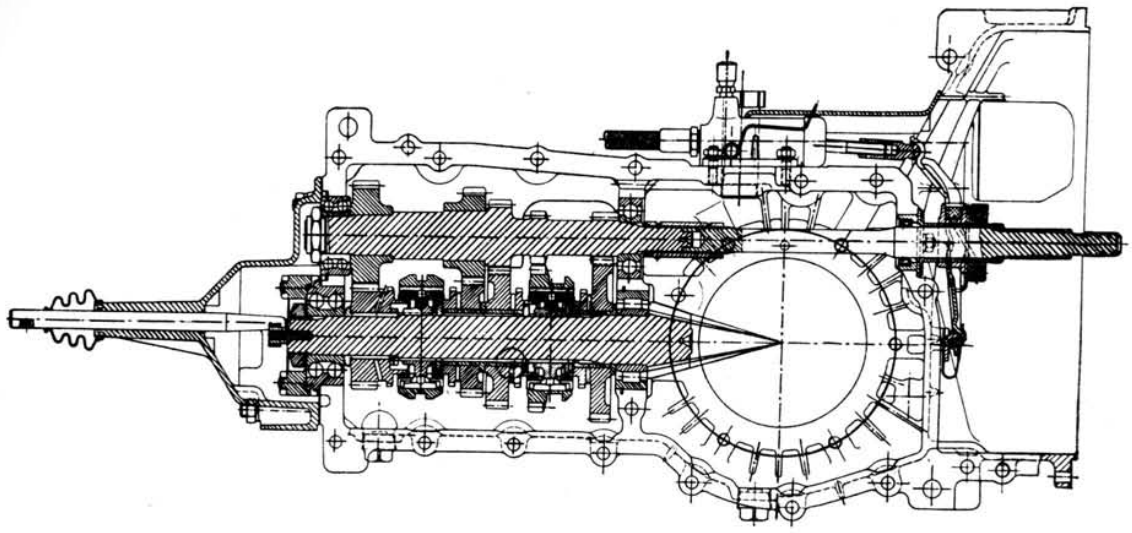
The clutch master cylinder is part of the assembly of the brake master cylinder and pedals. For the adjustment of the pedal free travel, etc. see Chapter 12.1.

Pipeline and Hoses

The rigid part of the pipeline comprises special steel pipes, the same as those of the brake system. However, they have a diameter of 6 mm as compared with the 5 mm diameter pipes of the brake system. For their servicing, repairs, and replacement see Chapter 9.7.

The flexible part of the clutch hydraulic line comprises a high-pressure brake hose. No special position or fastening are recommended.

4 - POWER TRANSMISSION MECHANISMS GEARBOX AND FINAL DRIVE



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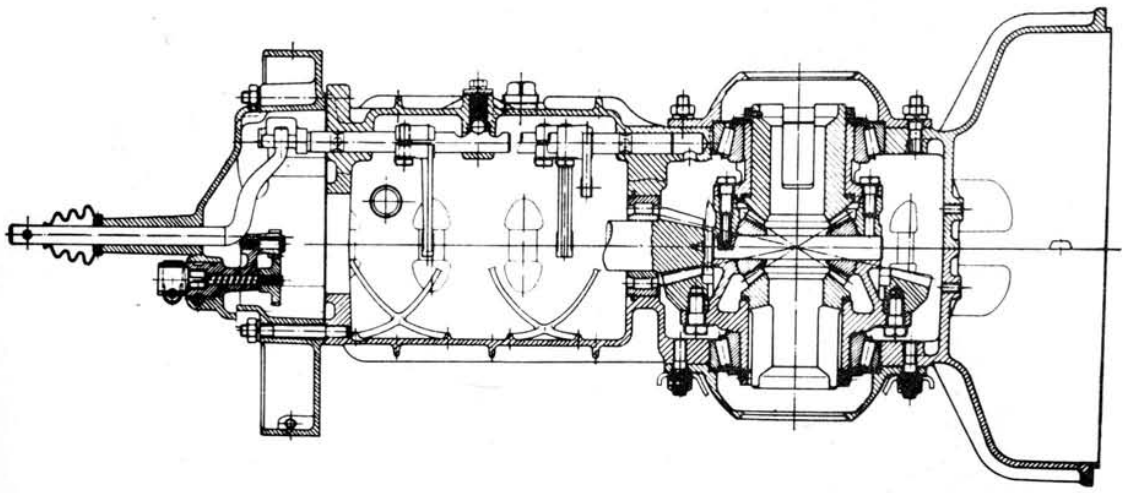

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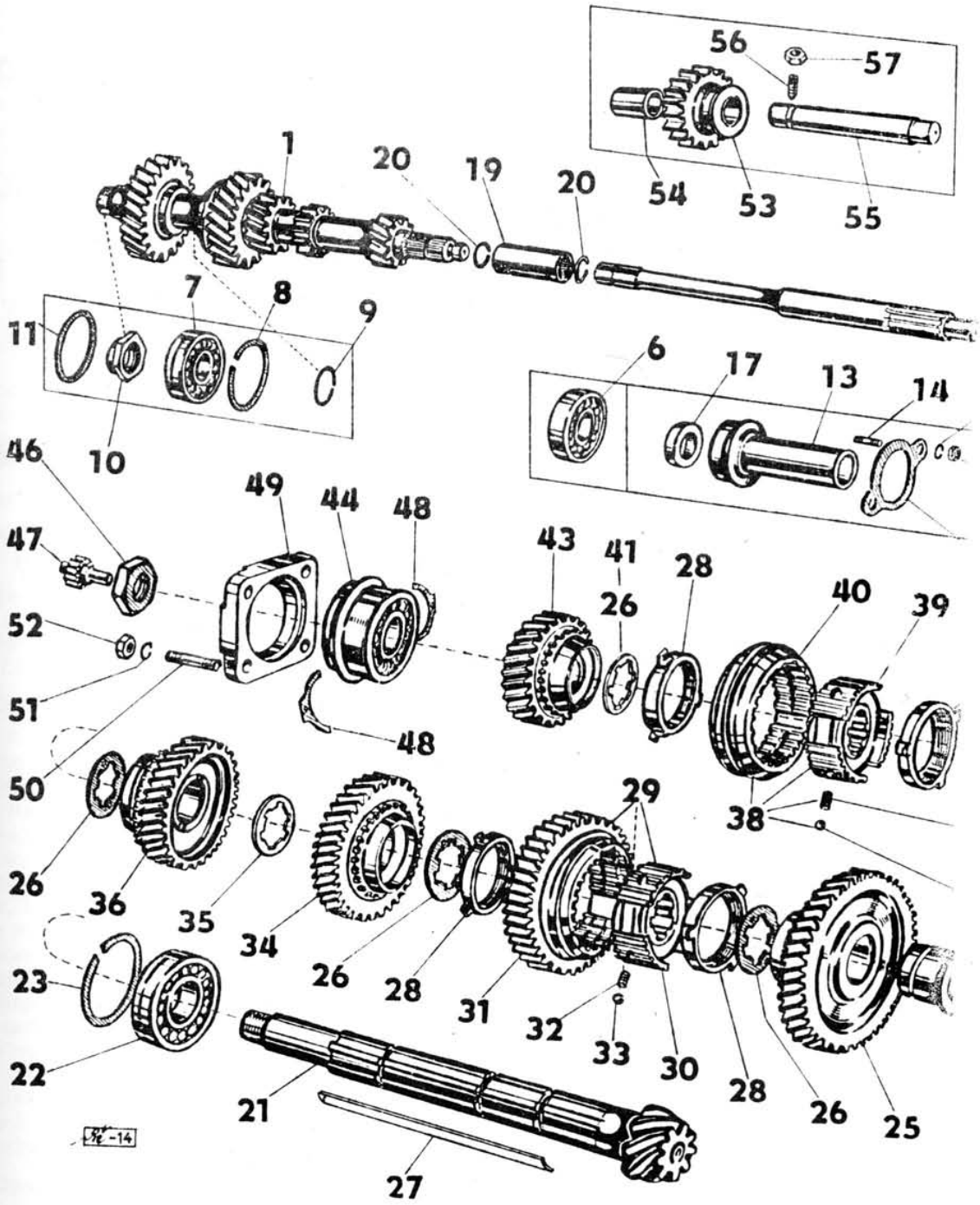
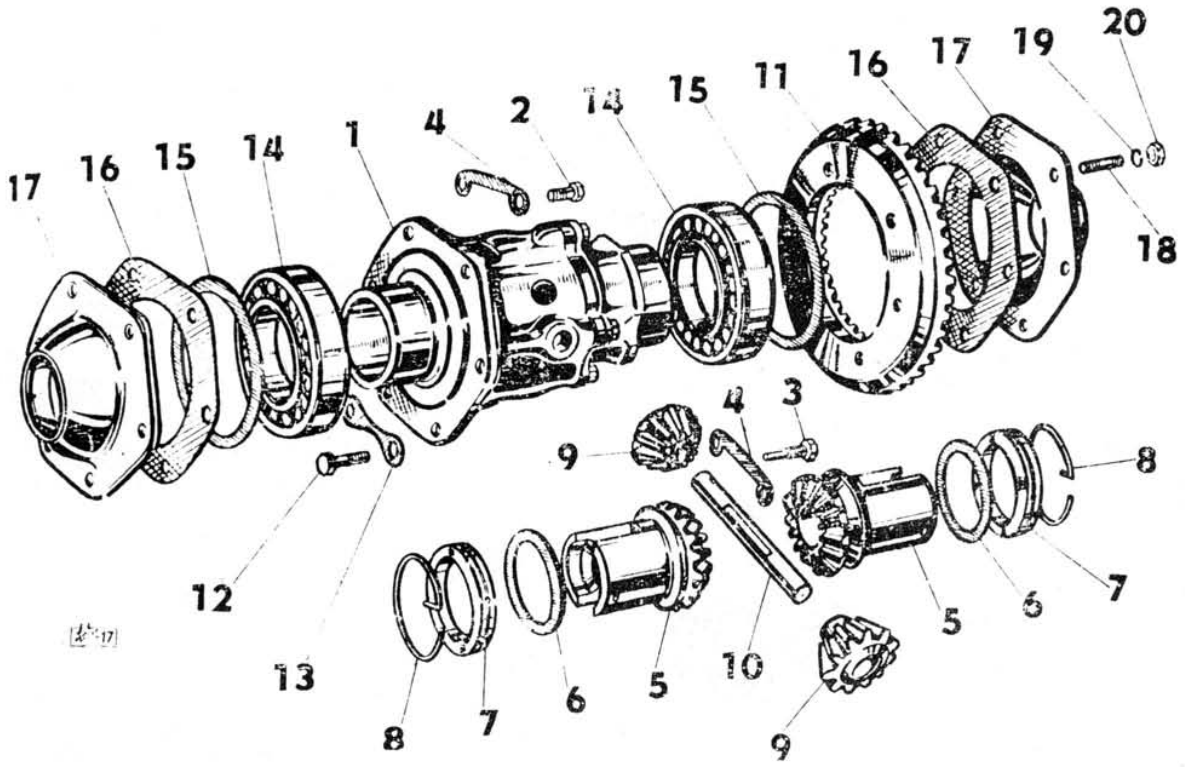
Fig. 4/1 - Gearbox, Final Drive, and Clutch Throwout Mechanism



GEARBOX GEAR CLUSTERS



FINAL DRIVE ASSEMBLY

Technical Description

The gearbox and the final drive form an integral unit assembled in a common housing. Neither of them is a separate assembly group.

Since certain component parts belong functionally to both mechanical units, the names "gearbox" and "final drive" are used only formally to describe the principal function of the respective unit and to facilitate identification.

The gearbox and final drive can be removed from the car only as a unit complete with the rear axle and the engine, with which they form the so-called power pack.

4.1 DISMANTLING AND REFITTING POWER PACK

The power pack comprises the engine, the transmission gear, and the rear axle, complete with their respective accessories - see Fig. 4.1/1.

Removal

a) **Preliminary Operations**

1. Jack up the tail end of the car to relieve the rear wheels, place supports under the body, and remove the rear wheels.

Drain the coolant from the cooling system - see Chapter 15.13.

b) **Operations from Outside the Car**

2. Prise up the lid on the floor tunnel in front of the rear seats and detach the hand brake cables after removing the adjusting screws.

3. Remove the covers from the floor boards behind the rear seat backrests. Disconnect the battery. Remove the clutch housing cover, disengage the pull-off springs of the clutch release lever, loosen and lift the clutch slave cylinder from the gearbox housing without disonnecting it from the hose. Cover the hole left in the housing to prevent any foreign matter from getting into the mechanism. A piece of paper pressed on to the protruding stud bolts of the housing will serve the purpose.

4. Proceeding from behind the rear seat backrest, fold back the trim on the wheel arch, detach the fastening of the telescopic shock absorbers, and push down their piston rods.

c) **Operations in Engine Compartment**

5. Remove the air cleaner and loosen all connections connecting the engine with the cooling system, the electrical equipment, etc. - see Chapter 2.1, paragraphs 2 and 3.

d) **Operations from Under the Car**

6. Disconnect the leads from the starter motor.

7. Pull out partially both hand brake cables, disconnect brake hoses from the brake system, and protect the hoses and the connection to the wheel cylinder against ingress of foreign matter in a suitable manner.

8. Lift the rear axle (installing the jack under the brake drum), remove the rear bolts of the yoke limiting the down-swing of the axle, and push aside the yoke as far as necessary for the removal of the axle.

Loosen the bolted connections of the radius arms with the body. Move a roll-a-car jack under the rear part of the gearbox/final drive unit just to support it.

Never slacken the bolted connections of the radius arms and the half-axles unless the replacement of the half-axle or its radius arm is necessary! By not interfering with the connection, you will avoid a rather difficult adjustment of the axle alignment on subsequent refitting of the axle in the car.

9. Remove the fuel tank sheet guard. Engage first or third gear, remove the connecting bolt of the shifter link, and move the gear change lever rearwards to sever the connection.

After having removed the bolt of the clip, detach the speedometer drive shaft.

10. Remove the shock-absorber holder and lift away the shock absorber.

11. Remove the right-hand splash guard of the engine including the oil cooler (depending on the engine accessories - see Chapter 2.1, paragraph 5). Detach the engine left-hand splash guard from the engine cross bearer.

12. Detach the power pack cross bearers from the body (the cross bearer of the gearbox and that of the engine).

e) **Removing Power Pack from Car**

13. Hold the power pack on the jack while moving it slowly backward. Take care that the front part of the gearbox passes safely the hose connecting the fuel tank parts. Then let go of the jack, lift the body using other jacks or supports, and finally withdraw the jack with the power pack from under the car.

Refitting

To refit the power pack in position in the car, reverse the dismantling procedure, i. e., proceed according to the paragraphs 13 to 1 above.

Compress the springs before installing them - see Chapter 8.2. Put threaded fastening inserts into the body brackets and the radius arm mounts from outside, and plain fastening inserts from inside, and clamp the connection lightly with the tie-bolt. Lower the car so that it rests on the wheels and load the rear axle approximately to its full loading - see Loaded Car in Chapter 6.1. After backing off the bolt slightly,

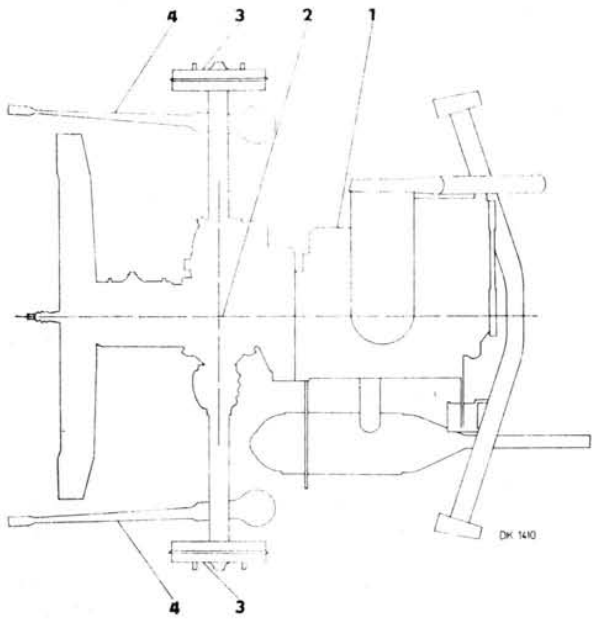


Fig. 4.1/1 - Power Pack

1 - engine with mounting, 2 - gearbox/final drive with mounting, 3 - rear axle (half-axles), 4 - radius arms

retighten it using the recommended torque (Chapter 1.8) and screw down the clinch nut.

If necessary, top up engine oil, fill the cooling system with an antifreeze, bleed the brake system, and adjust the hand brake. For the fastening of brake hoses (routing) see Chapter 9.7.

4.2 ASSEMBLING GEARBOX

Generally, the reassembly procedure depends on the extent, to which the unit has been taken apart. For betterunderstanding, we shall describe the procedure and peculiearities of reassembly of a completely disassembled unit.

Gear Change Mechanism

1. Clamp the right-hand half of the housing (when viewed from the flange securing it to the engine) in the MP 9-101 stand complemented with the MP 3-101 gearbox rack, and check the housing for completeness.

2. Install circlips on the striking fork rods of the reverse and 1st and 2nd speed. The ring with the lower nose is to be fitted on the 1st- and 2nd-speed rods.

3. Insert the reverse speed striking fork rod into the housing so that the inserted end protrudes slightly from its guide, slip on it the striking fork with the longer side of its head first, and push the striking fork rod through the fork and the end of the guide as far as it will go.

4. Fit the MP 3-109 jig into the free holes for striking fork rods (both pins of the jig), and proceeding through the hole in its side and using a stick or a length of wire, push the lock pin into the housing as far as it will go. Proceed in the same manner for inserting the next pin (use one pin of the jig). Shift it just so that the centre hole remains free for inserting the striking rod. Push the lock pin into the end guide of the striking fork rods also as far as it will go. The jig is not required for the installation of this pin.

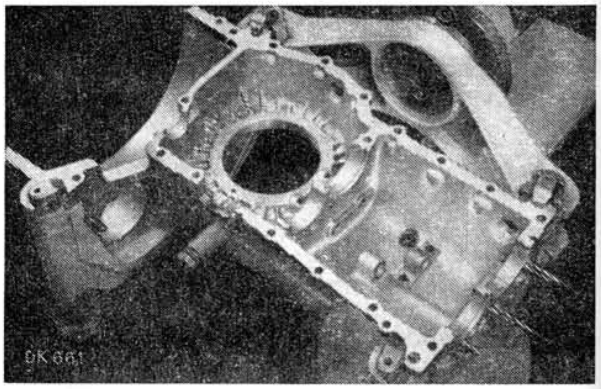


Fig. 4.2/1 - Clamping Gearbox Housing in Stand Using MP 3-101 Rack

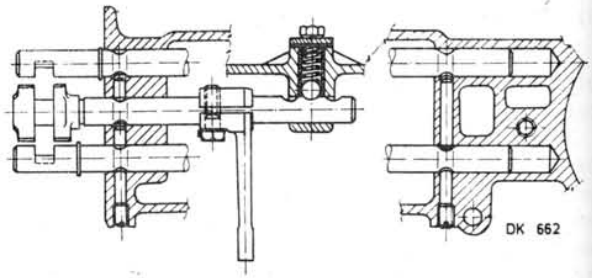


Fig. 4.2/2 - Locking Striking Fork Rods in Position by Means of Lock Pins and Balls

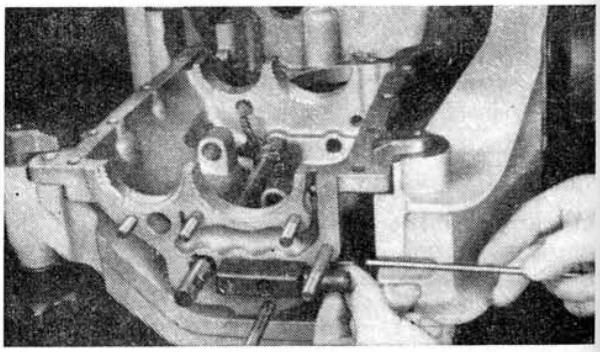


Fig. 4.2/3 - Installing Lock Pins Using MP 3-109 Jig

5. Proceeding in a similar manner as described in paragraph 3, insert the striking fork rods and forks of the 1st and 2nd, and 3rd and 4th speed flush with the reverse-speed striking fork rod, and close the holes for the lock pins in the bore with set screws.

6. Instal balls (3/8 in.) and springs in the guide bushes, fit the packing, and bolt on the cover installing spring washers under the bolt heads. Screw bolts in the striking forks with tab washers placed so that they rest on the edges of the striking forks.

Fit the stronger spring to the reverse-speed striking fork (longer spring, 35+2 mm) and the weaker springs (shorter, 32 mm) to the remaining forks.

7. Tighten the bolts lightly taking care that the forks remain free to move along the striking fork rods. Alternately engage and disengage the striking fork rods to check them for correct function and lubricate their guides with oil.

Reverse-speed Gear

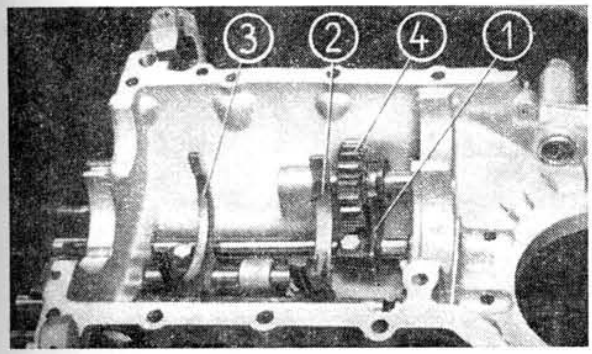


Fig. 4.2/4 - Gear Change Mechanism and Reverse-speed Gear

1 - Reverse-speed striking fork and rod
2 - 1st- and 2nd-speed striking fork and rod
3 - 3rd- and 4th-speed striking fork and rod
4 - Reverse-speed gear

8. Install the reverse-speed gear with the press-fitted and oiled bronze bush into the reverse-speed striking fork with the teeth facing inside the gearbox, and thread the gear pin through the housing lugs and the idler.

Turn the gear so that the punch mark at its end faces the threaded hole in the housing and lock it in position by screwing a bolt into this hole. Tighten the bolt and secure it with a nut.

Pinion Adjustment

9. Install the assembled pinion into the housing and, using the MP 5-102 bearing retainer, press the pinion bearing against the housing so that the pinion is pushed into the housing as far as possible.

If necessary, move the striking forks till the distribution of plays of synchronizing rings pushed into the synchronizing clutches (with a screwdriver, etc.) in neutral position corresponds with Fig. 4.2/5. Withdraw the pinion and lock the 1st- and 2nd-speed, and the 3rd-and 4th-speed striking forks in position by means of screws.

10. Put the MP 5-103 gauge into the housing threading it through the bore of the differential bearing, lock it in position by means of nuts, adjust the position of the pinion, and select shims required for the elimination of the pinion bearing clearance.

For measuring see Chapter 4.8.

11. Slacken the bearing retainer, place the selected shims under the bearing flange and hold them down by retightening the retainer. Fasten the cover of the differential tapered roller bearing to the housing by means of three nuts not forgetting the respective cover gasket.

To Adjust Synchronizing Clutches and Striking Forks

12. Push the 1st- and 2nd-speed striking fork rod and swing (rotate) it about the 1st-speed gear. Stop pushing the rod as soon as you feel the clutch engage and mark the end of the housing on the striking fork rod with a pencil. Return the striking fork rod to the neutral and mark again on it the position of the end of the housing. Finally pull the striking fork rod step by step, check the engagement with the other gear, and again mark the position of the end of the housing on the rod.

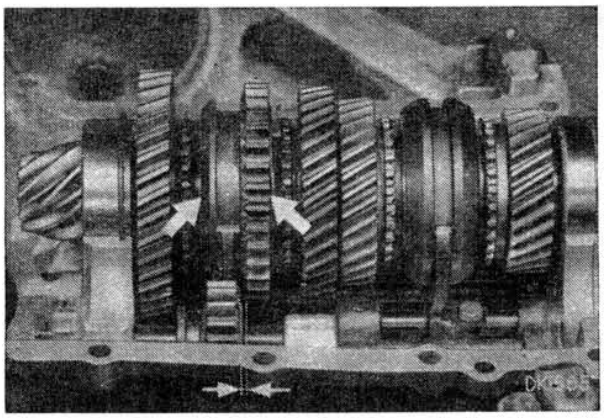


Fig. 4.2/5 - Approximate distribution of free play of synchronizing rings according to the symmetrically protruding conical surfaces of gears (marked with arrows) and position (backlash) of the reverse gear (marked with dimension)

Proceed in the same way with the 3rd- and 4th-speed gears.

If the marked position of the neutral is not midway between the side marks (check visually), remove the pinion, mark the positions of the striking forks on their rods (preferably on either side), slacken the forks and move them toward the required centre by the distance of the deviation of the neutral marking. Then lock the striking forks in position with screws. For the striking fork tightening torque see Chapter 1.8.

13. Adjust the reverse gear position so that there is a gap of about 2 mm between its teeth and the adjoining teeth, and swing the striking fork of the first and second speed to make sure that it cannot foul the teeth.

14. Reinstall the pinion with its respective washers and lock it in position. Shift the striking fork rods to make sure that, for example, a movement opposite to the required one of the striking forks did not take place, i. e. that the neutral is midway between the engagement positions of the synchronizing clutches. Correct any error and remove again the pinion.

Fitting Drive Gears and Clutch Shaft

15. Install the assembled drive shaft into the housing and slip the splined bush on it.

Tap home the seal ring with its sealing lip pointing outwards into the guide of the clutch throwout sleeve, and smear it with oil. Then thread the clutch shaft through the ring to install it into the splined bush and put it into the housing together with the guide provided with a coating of sealing compound on its cylindrical bedding surface. Secure both the shaft and the sleeve with circlips.

Install the sleeve guide with its drain hole level with the parting plane of the housing and facing the pinion.

For the special sealing compound see the note in Chapter 10.1.

16. Put the pinion with gears into the housing and oil all synchronizing rings. Fit the MP 5-104 jig for setting the crown wheel backlash into the bore of the differential bearing and the fitted cover, fit the assembled differential in it, and close the housing with the other housing half after having coated the sealing surfaces with a sealing compound.

Fit a rubber ring in the recess of the boss beside the stud bolt and put a spring washer under the nut. Tighten the remaining nuts without any washers (the stress of the bolts after the tightening of the nuts provides for their sufficient securing). Tighten the nuts moderately for the time being.

For the special sealing compound refer to the note in Chapter 10.1.

17. Proceeding through the bore of the differential bearing in the upper half of the housing, fit another jig, the MP 5-104, on to the differential with flanges clamped so as to fit into the tapered roller bearing cover, locate the cover packing, and fasten the cover by means of three nuts. If the clamping or drawing close of the flanges of this jig proves inadequate, it is necessary to draw close the flanges also of the first, previously inserted jig.

18. Drive the guide of the clutch throwout sleeve into the housing using the MP 3-103 drift, tap home the drive shaft, and insert two adjusting washers under the collar of the pinion shaft ball bearing on both halves of the housing after having determined their thickness by measuring.

Using a wire needle inserted into the holes of the tabs of the washers arrange the washers so that they do not overlap the parting plane of the housing, then install the cover and spring washers, and tighten the nuts (see Chapter 1.8).

19. Fasten the housing by tightening the nuts (see Chapter 1.8) and lock in position the guide of the clutch throwout sleeve with the respective clip using the spring washer under the clip nuts.

4.3 ASSEMBLING FINAL DRIVE

Refitting Differential

20. Turn the housing into the horizontal position. Rotate the ends of the knurled handles of the inserted jigs MP 5-104 to move the reinstalled differential (see previous paragraphs 16 and 17) until the crown wheel withdraws

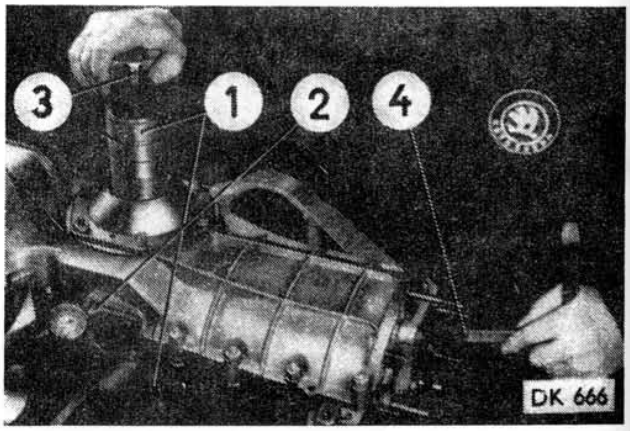


Fig. 4.3/1 - Adjusting Bevel Gear Backlash

1 - MP 5-104 jig, 2 - MP 5-101 jig,
3 - MP 5-106 jig, 4 - Screwdriver

from the pinion providing a larger backlash. Determine the backlash by estimation while swivelling the crown wheel.

To rotate the crown wheel use the MP 5-101 jig with its bifurcation engaging the differential star pinion shaft.

21. Install the MP 5-101 jig with dial indicator on the bolts of the housing top sight-hole and rotate the crown wheel so that the point of the dial indicator is as perpendicular as possible to the wheel tooth.

Retain the pinion with a screwdriver propped against the pinion nut and the edge of the cover. Then rotate the crown wheel until the teeth chatter and read off the respective backlash on the dial indicator. By turning the end of the handle of the MP 5-104 jig on the crown wheel side, decrease the backlash to the specified value - see Chapter 4.8. Rotate the end of the handle of the other MP 5-104 jig to open fully its circular jaws, and recheck the backlash (preferably in several positions of the crown wheel). If the backlash is correct, lock the opened flanges of the MP 5-104 jigs in their respective positions by tightening the lock nuts of the jigs.

Now the backlash of the bevel gears is adjusted and the opened (forced apart) discs or flanges of the MP 5-104 jigs fill the spaces for tapered roller bearings and adjusting shims. This situation is shown in the following illustration.

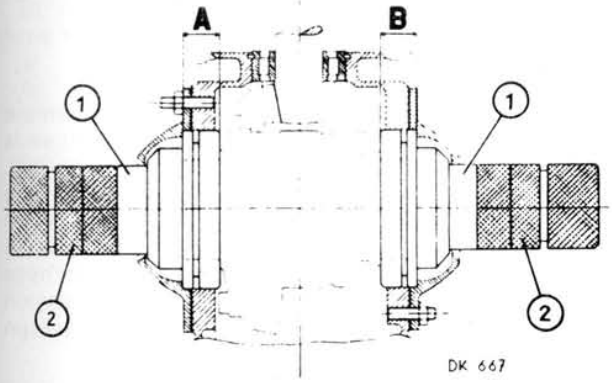


Fig. 4.3/2 - Determination of space required for tapered roller bearings and shims
1 - MP 5-104 jigs, 2 - lock nut

22. Remove the cover on the crown wheel side (turn the housing with the cover on top), withdraw the MP 5-104 jig, and measure the dimension "A" across the disk. This dimension has to be filled in accurately with the tapered roller bearing and shims.

Measuring and Fitting the Bearings

23. Unscrew the arm of the MP 5-105 jig, place the tapered roller bearing on the jig plate, and locate it on the plate by screwing down the arm. While tightening the arm, turn the jig so that the plate is on top (the rollers will bed correctly in the bearing races).

24. Use a micrometer to measure the dimension "C" across the plate and the bearing - calculate the average of the values obtained from several measurings - and determine the actual dimension of the bearing by subtracting 10 mm, i.e., the thickness of the plate, from the calculated average value.

The difference between the dimension "A" in Fig. 4.3/2 and the dimension "A_1" measured across the bearing is the space to be filled - in with shims. The shims are available in thicknesses of 0.08, 0.1, 0.3 and 1 mm, and the required number (the smallest possible) should be determined by a suitable combination of their respective sizes. If the required thickness cannot be obtained from the calculated dimension, make up the next smallest size and put the shims aside for later use.

25. Having measured the bearing, locate it on its respective bore in the housing, place on it the MP 5-107 jig (after loosening its bolt), and bolt the jig to the housing. Tighten slightly the loosened bolt to hold the tapered roller bearing in position.

26. Turn over the housing, remove the cover with the gasket and the MP 5-104 jig. Measure the dimension for the tapered roller bearing, the shims, and the tapered roller bearing itself in the manner described in paragraphs 22 to 24, and determine the required thickness of shims for the other side of the differential bearing (dimension "B" in Fig. 4.3/2). Add 0.05 mm and the reduction (10 mm) as specified sub paragraph 24 to the calculated dimension of the shims so as to be able to fit the bearing with a preload, and set up the shims.

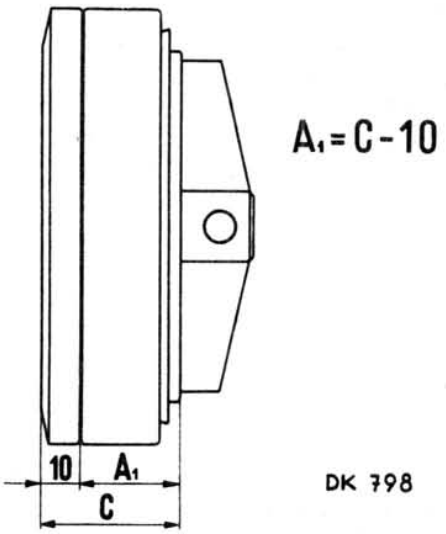


Fig. 4.3/3 - Clamping of Bearing in MP 5-105 Jig

If the shims cannot be set up exactly to the calculated thickness, determine a thickness which would result in a preload due to an overall increase of 0.03 to 0.07 mm of the dimension of the shims.

27. Place the tapered roller bearing on the respective bore, bolt the other MP 5-107 jig on the housing and rotate the centre bolt to press the bearing into the housing as far as it will go.

Remove the jig, fit the shrunk-on ring on the star pinion, and lock the ring in position using a circlip. Lubricate the bearing with oil, fit the respective shims on the bearing and the gasket on the cover, and bolt down the cover.

Turn over the housing and press-in the other bearing in the same manner (the press-fitting jig is already in position), install the prepared shims, and bolt down the cover with its gasket.

28. Measure how deep is the drive shaft bearing below the level of the housing surface and compensate the difference with shims up to a maximum protrusion of 0.1 mm ±0.05 mm.

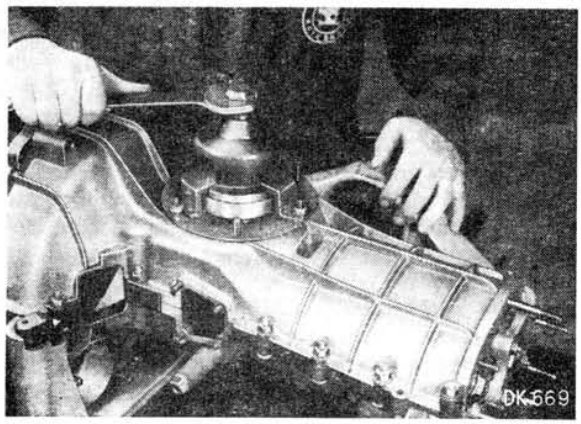


Fig. 4.3/4 - Press-fitting of Differential Tapered Roller Bearings Using MP 5-107 Jig

Shims 0.1 mm to 0.2 mm thick are available. Fit the gasket and the assembled cover on the housing and fasten it with nuts and spring washers (for the cover refer to Chapter 4.5).

Swing down the bearing with the speedometer drive gears in the cover into engagement with the pinion drive gear and lock the bearing in position by tightening the nut of the bearing clip.

Adjusting crownwheel Bearing

Alternative Method

a) Crown Wheel Bearing Preload.
Tools Dial Test Gauge and Stand
MP5 – 106 lever

Setting: Preload 0.05 – 0.10 mm

1. Before assembling Transmission casing remove outer crown wheel bearing races. Leave the bearings on the differential housing.

2. Assemble transmission. DO NOT carry out operation 17 above.

3. Fit the outer races into casing pressing into place using coned cover. Do not forget to fit gaskets. On the Selector Shaft side (side B) of the casing fit approximately 0.60 mm of shims between the coned cover and outer races. Ensure there is backlash between crownwheel and pinion, increase the shim thickness if required.

4. Fit Dial test gauge so that pointer rests on the differential as shown in fig. 4.3/1A.

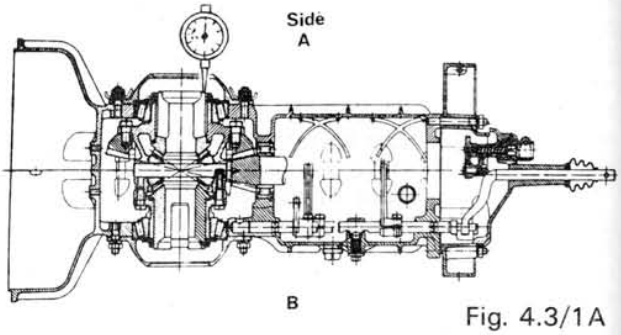


Fig. 4.3/1A

5. Lift Crownwheel assembly to determine clearance between bearings (a) . . . If this exceeds 0.20 mm decrease the clearance to between 0.01 and 0.20 mm by fitting shims to Non-selector side of casing. (b) . . . When the clearance is between 0.01 and 0.20 mm take a reading. Add to this 0.05 to 0.10 mm. Make a shim pack to this thickness and fit to non-selector side (side A) of transmission casing. Check some backlash still exists between the Crownwheel and pinion.

Example

1st Dial reading 0.30 mm
0.20 mm Shim fitted on non-selector side.

2nd Dial reading 0.07mm
Shim pack required between
0.07 + 0.05 = 0.12mm and 0.07mm + 0.10mm = 0.17 mm
Shim sizes available.
0.08, 0.14, 0.20 and 0.50mm
Shim size selected 0.14mm. This will give 0.07mm preload tension to crownwheel bearings.

The Crownwheel should now turn freely with little drag.

6. Remove Dial gauge.

b) Crownwheel pinion backlash.

Tools: MP5 -101
MP5 -106
Lever to lock pinion.

Settings: As specified on Crownwheel. If not legible use 0.13 – 0.18mm.

1. Install tool MP5 – 101 with dial indicator on one of the studs used for retaining the Clutch Glave Cylinder, then rotate the Crownwheel so that the point of the dial indicator is as perpendicular as possible to the wheel tooth.

2. Lock the pinion by using a suitable lever between the pinion nut and the pinion retaining cover.

3. Using MP5 – 106 rotate the crownwheel back and forth to determine the amount of clearance between the crown wheel and pinion teeth. This movement can be read from the dial gauge, and should be as written on the crown wheel (see page 84 Fig. 4.8/1 item 2). If this is not legible then use the figures between 0.13 – 0.18mm backlash.

4. Insufficient clearance indicates that crownwheel is too deeply in mesh with the pinion. To increase the clearance remove shim thickness from the non-selector side of the casing and place the equivalent thickness on the Selector Side. This will push the crownwheel across case and increase the backlash.

Excess clearance is corrected by moving shim thickness from the Selector Side to the non-Selector Side.

To work out the approximate thickness of shims to move use the following formula:–

(a) Backlash required 0.15mm
(b) Actual backlash 0.35mm

To calculate shims to transfer

(a) 0.35 -0.15mm = 20mm difference
(b) 0.20 x 1.5 = 0.30mm shims to transfer

Refitting Clutch Throwout Sleeve and Final Assembly

29. Install the support on the housing bolts and the release lever on the support, and fasten it with nuts and spring washers over the spring-loaded bracket

30. Smear with oil the sleeve guide and fit in position the sleeve assembled according to Chapter 3.6. If necessary, drip oil on the felt of the sleeve. Install the spring between the oil well and the bearing, open the spring ends, and hook the spring on to the lever.

31. Remove the mechanism from the assembly bracket, locate on it the clutch release cylinder with packing and the spring of the cover, and fasten it with nuts. Beside springs, insert also spring washers under the nuts.

32. Insert the rod with nut and finger into the cylinder, fit pull-off springs on the release lever and cylinder, and close the opening giving access into the mechanism by inserting a cover under the spring of the cylinder.

33. As required, close the mechanism using the filler neck cap. To plug the bottom holes use screws with magnets, and a screw without a magnet to plug the side hole. Install the reversing lamp switch or a plug screw (depending on whether the car is equipped with reversing lamps) into the side hole above the reversing shifter link.

4.4 DISMANTLING TRANSMISSION MECHANISMS

Replacing Clutch Shaft Seal

The clutch shaft seal can be replaced without removing the mechanisms from the car. For this purpose, remove the engine and lift away the (clutch slave) cylinder (do not disconnect the cylinder from the hose so as not to have to bleed the entire pipeline). Lift the end of the front circlip of the shaft through the hole left by the removed release cylinder and withdraw the clutch shaft.

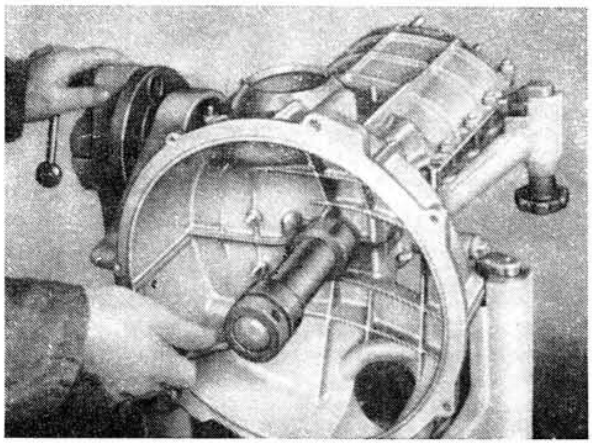


Fig. 4.4/1 - Removing Clutch Throwout Bearing Guide Using MP 3-102 Jig

Remove the clip of the clutch throwout bearing guide, insert the MP 3-102 jig into the guide, open its jaws, and withdraw the guide. After having renewed the seal ring, drive home the guide using the MP 3-103 drift. The drain hole in the guide must face downward.

The latest desing of the extracting jig has the type designation MP 3-112. Screw the jig bolt into the jig nut inserted into the mechanism through the hole cleared by the removal of the clutch release cylinder. Jerk the jig to drive the guide out of the housing.

Dismantling the Power Pack

For complete dismantling of the power pack, remove it from the car - see Chapter 4.1, "Removal of Power Pack from the Car". Then proceed as follows:

1. Remove the front cover and the cover of the pinion ball bearing, the clutch release mechanism, and the clip of the guide of the clutch throwout sleeve, i.e., all component parts attached to both halves of the housing.

2. Remove the connecting bolts of the flanges. Force apart the flanges using a screwdriver inserted into the chambers of the flange feet (lugs). Lifting away all component parts one by one is the usual procedure of dismantling. Taking apart of larger units (pinion, etc.) is described individually in the following chapters.

3. Press out the bearing cups which have remained in the housing after its halves have been separated. Use the MP 5-107 jig supported by the MP 5-108 jig.

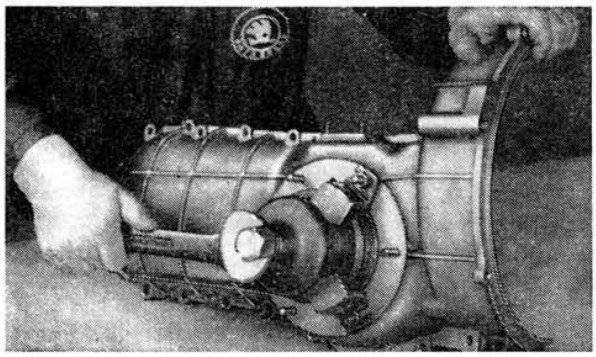


Fig. 4.4/2 - Pressing Out the Cup of the Tapered Roller Bearing Using MP 5-107 and MP 5-108 Jigs

4.5 FRONT COVER

The front cover assembly forms a self-contained unit fitted to the gearbox. For both the reassembly and dismantling place it on a work bench.

Assembling Front Cover

1. Slip the rubber seal ring on the speedometer bearing assembly (bearing with gears) and push carefully the bearing, preferably by a steady rotary motion, into the cover just far enough to be able to install the key without damaging the seal ring by the sharp edge of the keyway.

For the same reason, chamfer the edge of the bearing bore before installing the bearing in a new cover.

2. Lock the bearing in the axial direction by installing the key and spring washers, and by screwing down the nut. Slip the clip on the protruding part of the bearing and lock it also in the axial direction with a bolt, spring washer, and nut. Do not tighten the nuts fully.

3. Install the oiled gear change lever in the cover while pushing it only as far as the groove for the seal ring. With the lever in this position, insert the seal ring in its groove and push farther the lever through the ring. Slip the dust boot on the lever and attach it to the cover with a length of locking wire.

4. Attach the fastening (mounting) lugs using capscrews and spring washers. There is a right-hand and a left-hand lug, and their slots must be turned away from the cover.

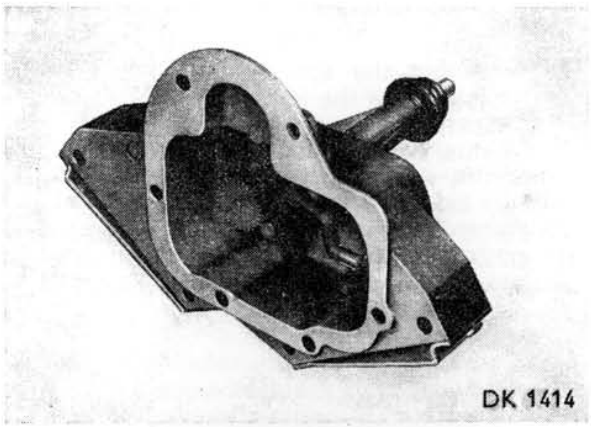


Fig. 4.5/1 - Front Cover Assembly

Dismantling Front Cover

Lift away the speedometer bearing after having removed the sleeve clamping bolt and the key (held down by the nut). Then withdraw the gear change lever by simply pulling it out.

4.6 PINION WITH GEARS

The pinion with gears forms a self-contained unit to be installed in the gearbox. Use a work bench and a press for both its assembly and

dismantling. The bevel pinion and the crown wheel are matched by selective assembly to ensure the lowest noise and the best meshing. Only a matched pair with the pinion and crown wheel marked with the same number is permitted to be fitted into one gearbox and final drive. For their numerical marking see Chapter 4.8.

When renewing some of the gears, replace also the meshing gear on the drive shaft with a new one. An old gear meshing with a new one is apt to cause noisy operation.

Assembling Pinion

1. Press the inner roller bearing race on the pinion, smear it with oil and slip on it the outer part of the bearing with its outer thrust ring away from the pinion shaft, i. e. toward the gears to be fitted next. Use the MP 3-104 plate with the thrust head to protect the ground face of the pinion when pressing - on the bearing race. The ground face of the pinion must never be damaged since it is used for measuring!

2. Slip on the 1st-speed gear bush with its collar toward the bearing and install the friction ring in the shaft groove between the edge of the groove and the bush to try its suitability. The rings are supplied in four thicknesses from 3.5 to 3.8 mm stepped up by 0.1 mm. Select the thickest one which is a tight fit in the groove and put it aside for eventual locking of the 1st-speed gear.

3. Having smeared the bush with oil, slip on it the 1st-speed gear. Now insert the previously selected friction ring with its oil grooves towards the gear or the old ring removed during dismantling. Turn the ring by a groove pitch (by tapping with a drift in its aperture) to lock it in position, and make sure that the gear is free to rotate.

Clamp the pinion into the MP 3-105 or MP 3-111 fixture (new design).

Note: It is recommended to lubricate the inner bore of gears with the Molyka paste (containing molybdenum disulphide) when using either a new gear, a new pinion, or a new 1st--speed gear. Lubricating oil will do for run-in parts.

4. Turn the ring so that the dog of the grooving does not obstruct the groove in the pinion. The same applies to all the remaining friction rings to be fitted (two similar with oil grooves on one side and one ring with oil grooves on both sides).

5. Omit the following groove for the lock ring and fit the ring with grooves on both sides into the next groove. Choose the ring from among the sizes 3.50, 3,53 and 3.55 mm and use the one

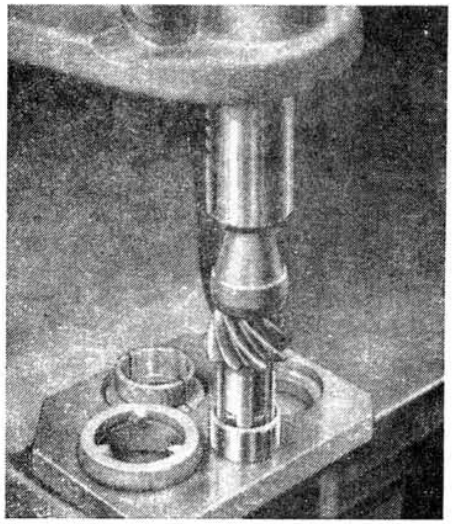


Fig. 4.6/1 - Pressing-on Bevel Pinion Bearing Using MP 3-104 Plate and Thrust Head (of Škoda 100 cars; if not available, any type of plate and support will do)

Fig. 4.6/2 - Determination of Friction Ring Thickness

which will be the tightest fit in the groove. Try the ring acording to Fig. 4.6/2.

It is recommended to try several rings of one thickness class and to use the thickest with regard to tolerance limits. It has to fit in the groove with a clearance of 0+0.02 mm. Then remove the ring and put it aside.

6. Fit an arbitrarily selected ring of the range of rings mentioned in paragraph 2 into the previously omitted groove, install the 2nd-speed gear, lock it in position with a ring determined and tried in compliance with paragraph 5, and finally measure the axial clearance of the gear. This clearance should be within tolerance limits of 0.1+0.07 mm and it can be adjusted by a repeated removal and change of the ring

in the other groove. Chose the ring also with regard to tolerances available in one class of the rings as mentioned in the previous paragraph. Check the clearance of the gear with the aid of a dial indicator.

Then remove the gear including the friction ring in the second groove of the shaft.

7. Place the lock of the 1st- and 2nd-speed synchronizing clutch on the bench with its teeth downward. Install springs in the clutch core securing them with grease against falling out and insert the clutch core with the shorter side of the inner head on top in the respective gear.

Locate balls (dia. 1/4 in.) on the springs, compress the springs with the fingers or using a suitable rod, and fit the complete core into the gear.

8. Having thus asembled the synchronizing clutch lock, install the synchronizing ring from the opposite side of the gear. Now thread the lock on the oiled shaft with the gear facing away from the shaft.

9. Install in position the previously selected friction ring with its groove facing away from the shaft (toward the gear) and insert the synchronizing ring into the fitted lock of the synchronizing clutch. Slip the oiled gear and the previously selected friction ring on the oiled shaft.

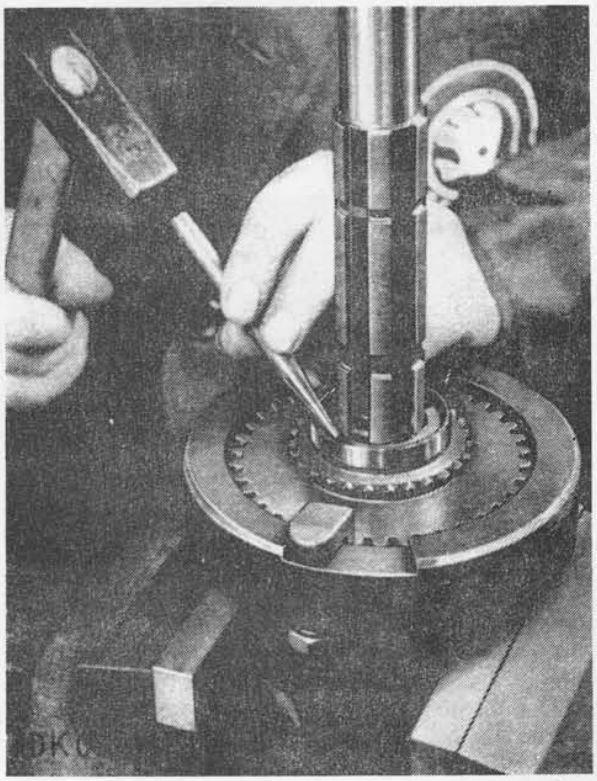


Fig. 4.6/3 - Locking 1st-speed Gear in Position (turning the ring with a drift) with the Pinion Clamped in MP 3-105 or MP 3-111 Jig

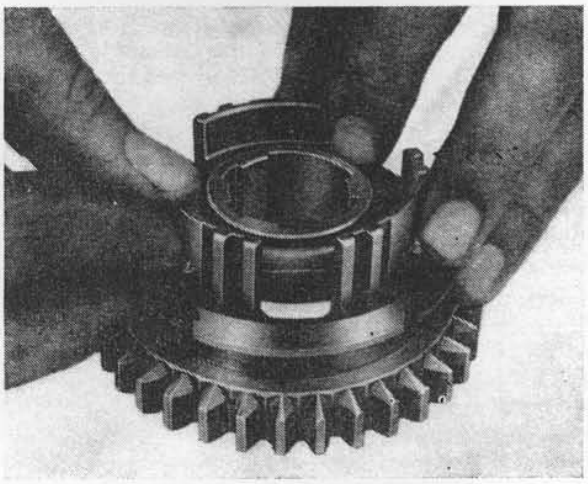


Fig. 4.6/4 - Assembling 1st- and 2nd-speed Synchronizing Clutch - Installing the Core and Pressing in the Balls

10. Slip on the 3rd - speed gear and secure it with an arbitrarily chosen ring from the range of friction rings in compliance with the paragraph 2. Measure the axial clearance and adjust it to 0.1+0.07 mm by a repeated exchange of the friction ring.

Now remove the gear, lubricate it, slip it on the oiled shaft and lock it in position with the ring with the oil groove facing the gear.

11. Proceeding according to paragraph 2, insert an arbitrary friction ring into the last groove, slip on the 4th-speed gear and tighten the pinion nut over a pilot collar replacing the bearing (for example of dimensions dia. 25.5/38×26 with edges of the inner bore chamfered to 1×45°). Mark the side of the pilot collar which will be turned toward the nut so that the side facing the gear cannot be damaged by impression. Adjust the clearance of the gear to 0.1+0.07 mm by a repeated trying on (exchange) of the friction rings. Then remove the gear and the ring from the shaft.

12. Assemble the 3rd- and 4th-speed synchonizing clutch using the same method as when having assembled that of the 1st and 2nd speed. Insert the synchronizing ring into the clutch and slip the clutch on the oiled shaft with the short side of the lock first.

13. Install the selected friction ring in the locking position into the groove with its oil groove facing away from the shaft. Push or tap home the key into the spline of the shaft so that it passes through all friction rings and its end is at least flush with the splined shaft end.

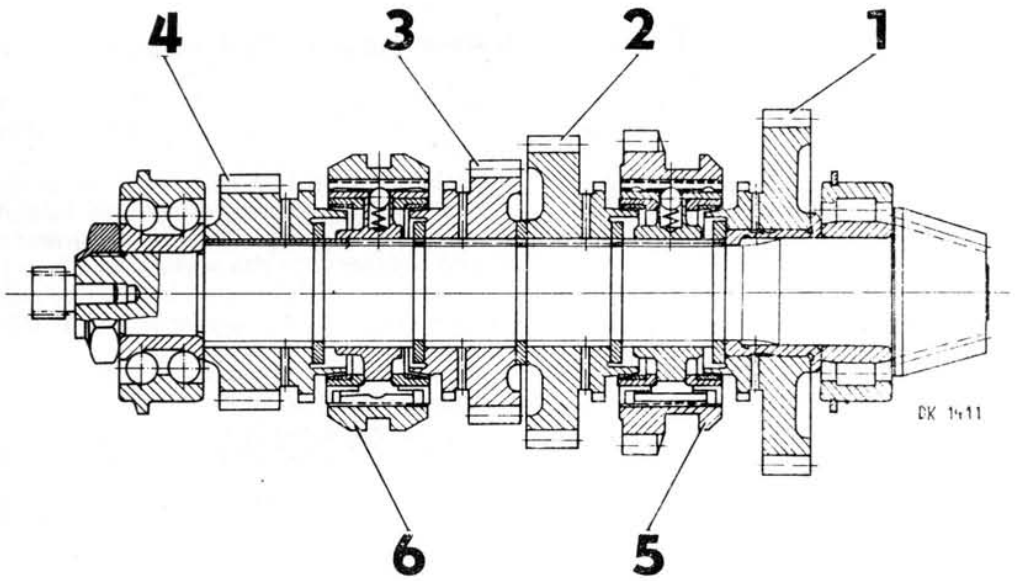


Fig. 4.6/5 - Completely Assembled Pinion
1 - 1st-speed gear, 2 - 2nd-speed gear, 3 - 3rd-speed gear, 4 - 4th-speed gear, 5 - 1st- and 2nd-speed synchronizing clutch, 6 - 3rd- and 4th-speed synchronizing clutch

Fig. 4.6/6 - Tightening Pinion Nut in MP 3-105 or MP 3-111 Jig

Note: If reassembly jobs are done frequently, it is recommended to make an auxiliairy (pilot) key with a point. When pushed into the spline, it will align any turned friction rings and thus the fitting of the actual key will be facilitated.

14. Insert the last synchronizing ring into the lock of the synchronizing clutch, oil the shaft, and slip on the oiled gear. Press on the ball bearing with the collar facing away from the shaft. Check all gears for free rotation, screw down the nut (for its tightening torque see Chapter 1.8), and tap its neck home into the spline of the shaft.

15. Complete the assembly of the pinion by pressing-on the speedometer drive gear (gear with pressed-on pin).

Press-on the gear carefully so as not to squeeze it between the press and the pinion. It is recommended not to press the gear fully home but to leave a clearance of 0 to 0.5 mm.

Pinion Disassembly

1. Clamp the pinion in the MP 3-105 jig (see its illustration in Figs 4.6/6 and 4.6/3) and screw off its nut. Fit the MP 3-108 puller on the bearing and rotate its bolt to remove the bearing.

Now all gears and synchronizing clutches are released and ready to be removed by simply slipping them off the shaft after withdrawing the key (see paragraph 13) and turning slightly the friction rings locking in position the gears.

2. If it is necessary to remove the inner race of the roller bearing, grind it to a maximum

length and depth and strike it off while still hot from grinding.

Caution! The jig used for other types of Škoda cars cannot be used for removing this race!

Although the parts are identical at first sight, the teeth of the pinion are larger and they would not pass without a damage through the jig.

When dismantling the synchronizing locks, support the clutch core with an object about 20 mm high, take the lock between the palms of both hands, and pull it off the core. The balls and springs ejected from the core will fall in your palms.

4.7 DRIVE SHAFT C/W GEARS

Like the driven shaft, i. e. the pinion with gears, the drive shaft with its gears forms a unit to be installed in the gearbox. For assembling the drive shaft, use again the work bench and a press. When replacing one of the drive shaft gears with a new one, it is necessary to renew also its meshing gear on the driven shaft (pinion).

Assembling Drive Shaft

1. Using a grindstone, chamfer the sharp edges of both gears at the point of their inner cylindrical bores and the lateral chamfer of these bores.

2. Heat up the 3rd-speed gear to a temperature of 80 up to 100 °C, insert it with the longer side of the inner head first into the MP 3-106 support and shrink-fit the shaft. Use the other part of the support, the buttress plate, slipped over the spherical end of the drive shaft as a thrust pad between the shrink-fitted shaft and the press spindle.

3. Heat up the 4th-speed gear like the previous gear and shrink-fit it on the shaft – see Fig. 4.7/2.

4. Press the ball bearing with its outer thrust ring away from the shaft to the 4th-speed gear, and another ball bearing to the 1st-speed gear. Use the other half of the MP 3-106 support for pressing-on the bearings.

5. Clamp the shaft in a vice (providing the vice jaws with sheet linings) by the flanks of the 4th-speed gear and tighten the nut. Hammer down the nut neck into the shaft groove.

Use a new nut if the neck of the old one is damaged.

Eliminate any stress resulting from shrinking on the gears by tapping the gears and the shaft with a mallet.

Dismantling Drive Shaft

1. Clamp the shaft in a vice across the face of the 4th-speed gear and screw off the nut. Install the shaft in the MP 3-106 support by the outer bearing race and press off the bearing.

2. Press the shaft out of the bearings by placing the support successively under the individual gears and the second bearing. Protect the shaft spherical end – use the buttress plate for pressing off – see paragraph 2 of the previous section.

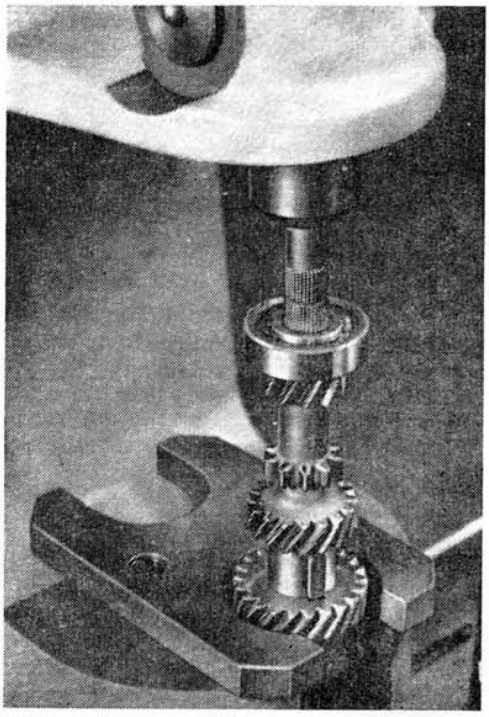


Fig. 4.7/1 – Shrink-fitting of Gears on Drive Shaft Using MP 3-106 Support (two-part jig consisting of the support proper and the buttress plate)

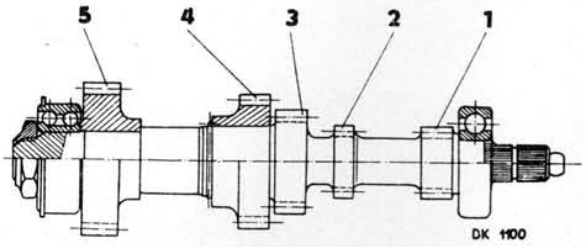


Fig. 4.7/2 – Drive Shaft c/w Gears

1 – 1st-speed gear, 2 – reverse gear, 3 – 2nd-speed gear, 4 – 3rd-speed gear, 5 – 4th-speed gear

4.8 BEVEL GEAR DRIVE

General Information

The bevel gear drive is formed by the pinion, i. e., the drive shaft of the gearbox, and the differential crown wheel. Both parts are run-in together on a special machine, tested and checked for the most advantageous backlash (meshing), and the respective data are marked on them.

Only matched gears, i. e., a pinion and a crown wheel with the same numerical marking, can be installed in their common housing.

Bevel Gear Marking

Spark-erosion is used for marking the gears with numerical symbols shown in the illustration (Fig. 4.8/1).

The pinion is marked with a single number (175) which is the number of the pair of gears like the number 175 on the crown wheel. The first part of the second number, i. e. before the fraction line (59.60), indicates the distance of the pinion ground face from the axis of the gear crossing in millimetres (distance A), the second part of the number (25) indicating the backlash in hundredths of millimetres. If these data are missing, the backlash should be 0.13 ÷ 0.18 mm.

Adjusting Pinion in Housing

To adjust the pinion in the housing, i. e. to set the distance of the pinion ground face from the axis of the gear crossing, insert shims under the flange of the pinion outer ball bearing. Use the MP 5-103 gauge for measuring the distance.

1. Fasten the gauge to the housing and check the dial indicator or adjust it using the measuring contact of the gauge. The pointer must coincide with the figure 1 (one) of the small scale with 1 mm divisions, and the pointer of the large scale (peripheral scale) with 0.01 mm divisions must point to zero. For a rough setting, slightly lift the dial indicator in the holder and then turn slightly the peripheral scale for fine adjustment.

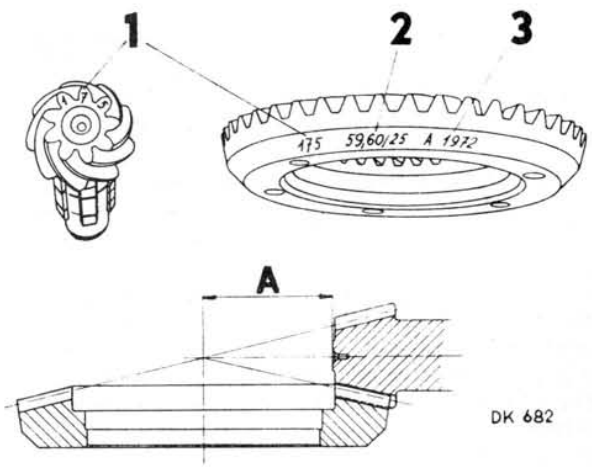


Fig. 4.8/1 - Marking of Bevel Gear Sets
1 - number of gear set, 2 - assembly data, 3 - production data (they may be omitted)

2. Install the MP 5-102 bearing retainer on the bolt of the gearbox/final drive housing and use it to push the pinion bearing against the housing. Rest the dial indicator tip against the pinion ground face. Now move gently the tip over this face stopping at the point, in which the indicator pointer changes the direction of its rotation. With the dial indicator tip in this position, read off the deviation, i. e., the deflection of the pointer, from the preset zero position.

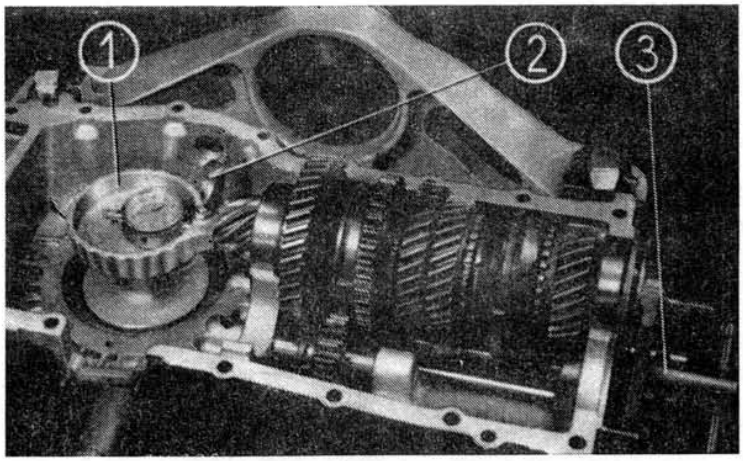


Fig. 4.8/2 - Measuring Pinion Position
1 - MP 5-103 adjusting gauge, 2 - marking of gauge setting, 3 - MP 5-102 bearing retainer

3. To evaluate the data obtained from the dial indicator reading and the data of the gear set, adopt the following procedure:

The setting distance of the gauge - 60.00 mm - is marked on the gauge arm; the reading of the dial indicator has shown a deviation of e. g. plus 66 divisions, i. e. 0.66 millimetres (plus means that the tip of the gauge is pushed inward from the set zero position and the indicator reading is higher; a reverse deviation – minus reading - cannot practically occur). By subtracting this deviation from the measure on the gauge, the actual distance between the pinion ground face and the gear cross axis will be obtained, i. e. 60.00 mm minus 0.66 mm = 59.34 mm.

The measure on the crown wheel indicating the assembly distance of the pinion is, for example, 59.60. Accordingly, the pinion must be moved slightly out of the housing 0.26 mm, i. e., by the difference of the two measurings (59.60 minus 59.34 = 0.26 mm).

4. Prepare adjusting shims 0.30 mm thick to be inserted under the flange of the pinion bearing on further assembly of the housing.

Shims 0.14, 0.2, 0.3, and 0.5 mm thick are available. If the required accurate outward shifting of the pinion cannot be achieved with shims of any of the specified thickness, combine them to obtain the next higher value.

Note:

The thickness of shims required for the adjustment of the pinion can be also calculated in the following way:

a) Set the dial indicator of the MP 5-103 gauge as in paragraph 1 of the preceding text, i. e., with the gauge adjusted on the measuring contact, the reading of the dial indicator will be 1.00 mm.

b) Swing the tip of the dial indicator against the pinion ground face and push the pinion by means of the MP 5-102 bearing retainer into the housing till the dial indicator reads 1.00 mm.

c) Push the pinion further into the housing (while watching the deflection of the pointer) until the assembly measuring is obtained (the 59.60 measure on the crown wheel), i. e., by the difference of this measuring from 60.00 mm - in our example 60.00 minus 59.60 = 0.40 mm.

d) Without changing the position of the dial indicator, push the pinion into the housing as far as it will go - the difference of the dial reading from the previous 0.40 mm is the thickness of the required shims (0.26 mm). Or, without changing the position of the dial indicator on the pinion, turn the scale to zero (0). The deflection of the pointer after pushing the pinion into the housing is the measure (thickness) of the shims.

4.9 DIFFERENTIAL

Assembly

1. Install the sun gear (planet) without the friction washer, the two star pinions (satellites), and the pilot pin for the star pinions into the left-hand half of the differential case (with the flange for the crown wheel). The original differential pinion shaft pressed into the case must be replaced temporarily by the pilot pin to facilitate handling.

2. Push the sun gear from outside into engagement with the star pinion teeth and use a depth gauge to measure the dimension by which it protrudes from the housing. Then, proceeding from inside, push the sun gear into the abutment surface of the differential case and measure again by how much it protrudes from the housing. The difference of both measurements determines the gap for the sliding ring. The rings are supplied in thicknesses of 1.8, 1.9, 2, 2.1, 2.2, and 2.3 mm. Select the ring which is 0.1 mm thinner than the calculated dimension of the gap.

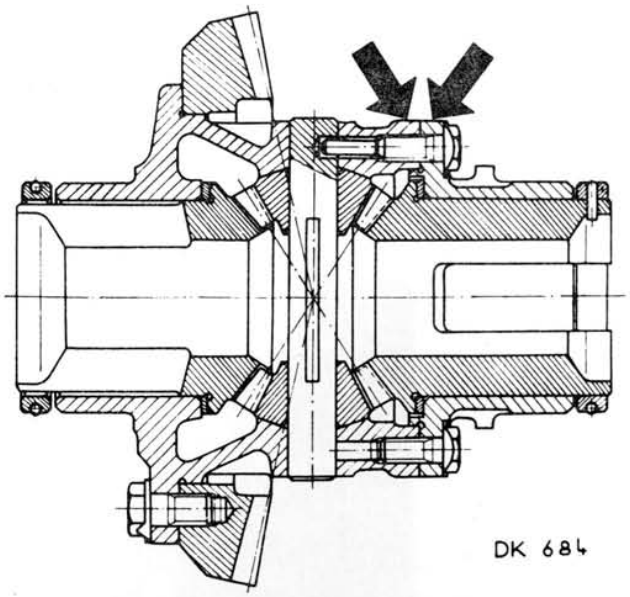


Fig. 4.9/1 - Sectional View of Differential

The arrow points to the mark indicating the side for pressing-on the differential pinion shaft. Any symbol can be used (a figure, a letter) but it must be identical for both parts of the differential. It also indicates the correct relative position of the two differential parts.

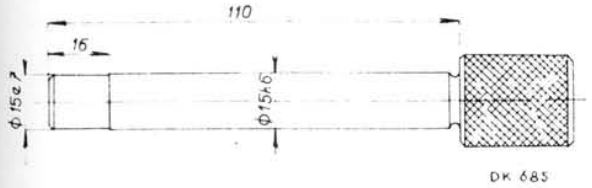


Fig. 4.9/2 - Pilot Pin for Star Pinions (dimensions of the grip are arbitrary)

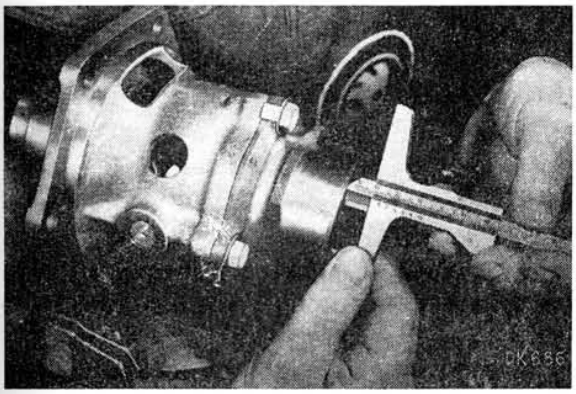


Fig. 4.9/3 - Measuring Sun Gear Protrusion above Housing Throat

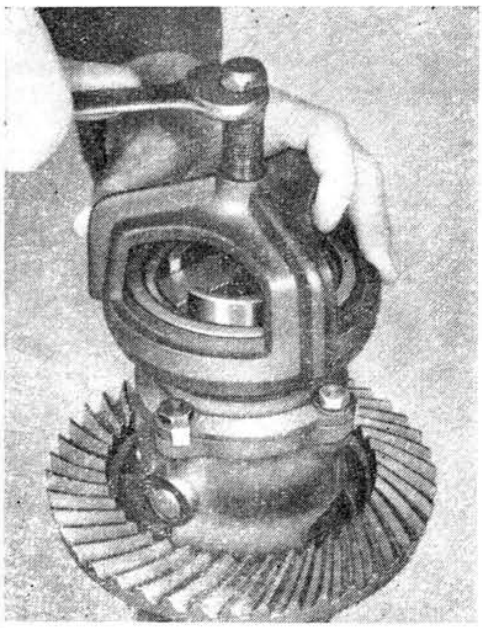


Fig. 4.9/4 - Pulling Off Differential Tapered Roller Bearing Using MP 5-109 Jig

3. Remove the star pinion pilot pin and all the gears, slip the oiled sliding ring on the sun gear, install it in the housing, and refit the star pinions using again the pilot pin. The sun gear must rotate freely with a minimum backlash of the star pinion teeth. Excessive backlash is apt to cause chattering of the teeth and noisy operation.

4. Replace the pilot pin with the original pinion shaft and press the latter into the marked hole in the housing with the end without the locking hole first - see Fig. 4.9/1. Before pressing it in, rotate the shaft till the lock hole is directly opposite the threaded hole of the housing, and check it for proper alignment with this hole while completing the pressing.

5. Install the other sun gear into the other half of the differential case, bolt the case halves together and proceed to determine and check the sliding rings as per paragraphs 2 and 3.

Now clamp together the case with bolts not forgetting the washers (the bolt with the pin is intended for the lock hole of the differential pinion shaft).

Clean thoroughly the mating faces of the crown wheel and the differential case and install the crown wheel. Lock the bolts by bending the sheet lock washers.

Dismantling

Dismantling of the differential is a current disassembly procedure. Press out the differential pinion shaft from the side of the unmarked hole of the case.

For pulling off the cones of the tapered roller bearings from the differential case use the MP 5-109 jig. Fit the jig over the tapered rollers of the bearing and swivel it so that it engages with their faces.

4.10 CROSS BEARER

On assembly, fit the rubber silentblock, the disk-type spacer, and the bolt into the cups of the cross bearer. Install the other, ring-type silentblock over the neck of the spacer into the smaller cup on the opposite side together with the plain thrust washer, the spring washer, and then screw down the nut on the bolt by using only the fingers.

When assembling the cross bearer with the gearbox, slacken the nuts to obtain a gap between the bolt head and the spacer disk large enough to take the lug of the gearbox. When retightening the nuts, make sure that the nose of the bolt head fits into the recess (slot) of the lug.

5 - REAR AXLE

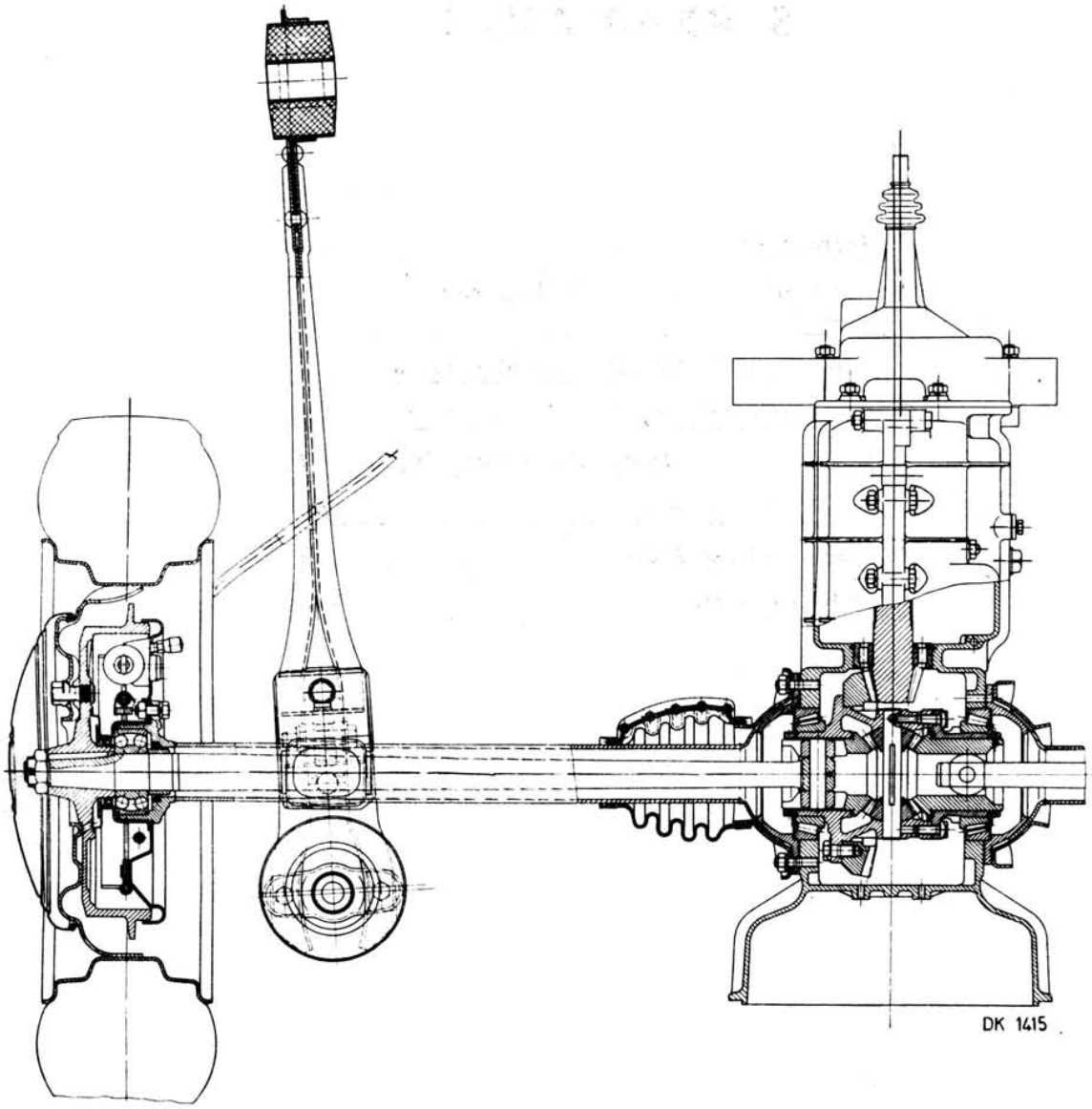


Fig. 5/1 - Rear Axle

Technical Description

The rear axle consists of swinging half-axles joint-mounted on the gearbox and final drive housing and of radius arms, rigidly mounted on the half-axles and resilient mounted on the body. Coil-spring suspension is provided, supplemented with hydraulic telescopic shock absorbers.

5.1 DISMANTLING AND REASSEMBLING REAR AXLE IN CAR

The rear axle can be dismantled (and reassembled in reverse order) in the car after removing the road spring and detaching it from the other car component parts, or after having removed the complete power pack. For particulars regarding dismantling of brakes and disconnecting of brake cables, see Chapter 4.1, paragraph d).

If dismantling is not effected for the purpose of renewing the half-axles or radius arms, never disconnect the arms from the half-axles if you wish to avoid the rather complicated and exacting procedure of wheel alignment (adjustment of rear axle geometry) on reassembly.

Partial dismantling jobs, which can be carried out with the rear axle in situ, are the dismantling and reassembly of the brake system and the replacement of the road wheel ball bearings and springs.

Replacement of Ball Bearing and Access to Brake Mechanisms, Replacement of Sealing Ring

1. Remove the road wheel, secure the car against moving, and release the hand brake. If the condition of the brake system is not known, suck off a small amount of the brake fluid from the tank (if full) and remove the upper plug of the brake backing plate - see Fig. 9.8/2. Using a screwdriver, force back the swinging arm of the brake self-adjuster to make the brake shoes contract.

Remove the nut of the shaft and screw down the auxiliary nut of the jig in its place. Now fasten the jig on the wheel hub. Use a rod as a brace to prevent the shaft from rotating and pull off the wheel hub with the brake drum by tightening the centre bolt.

If tightening of the bolt fails to move the wheel hub, tap the bolt with a hammer. The impact stress will help to free the hub.

Mark suitably the wheel hubs (right-hand, left hand) in order not to mix them up on reassembly.

2. Remove the key from the axle shaft, and lift away the socket cap and the entire brake mechanism. Screw the MP 5-112 jig on the shaft and fasten it to the half-axle socket flange. Now turn the jig wrench to force the shaft into the half-axle as far as it will go without undue force (about 10 mm) and, by turning the wrench in the opposite direction, move the shaft complete with the ball bearing about 7 mm out of the half-axle. It the jig fails to push home the axle shaft, drive in the shaft using a suitable pad to avoid damage to the shaft thread and taper. However, the MP 5-113 jig should be preferred. Fit it on the flange as the aforesaid MP 5-112 jig, fasten to it the MP 5-111 or MP 5-152 puller, and proceed to force the axle shaft clear off the bearing.

Insert the forked plate of the MP 5-112 jig between the bearing and the socket and turn the wrench to force the shaft back into the half-axle till the ball bearing slides over the shaft taper. Now remove the jig carefully so as not to dislodge the shaft - see paragraph 3.

3. Lock the shaft in position to prevent it from sliding out of the half-axle by fitting the MP 5-114 jig (see the next chapter, Fig. 5.2/3), and push the shaft into the half-axle.

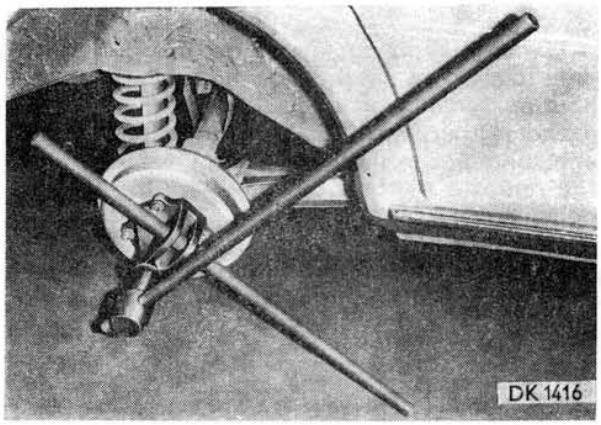


Fig. 5.1/1 - Pulling off Wheel Hub Using MP 5-111, MP 5-152 or MP 5-153 (recent version) Jig

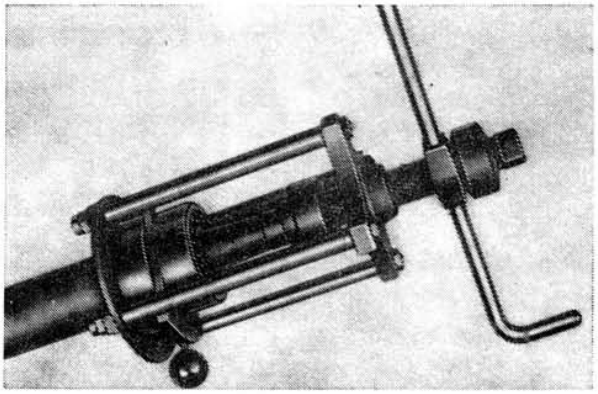


Fig. 5.1/2 - Removing Ball Bearing Using MP 5-112 Jig and Its Forked Plate

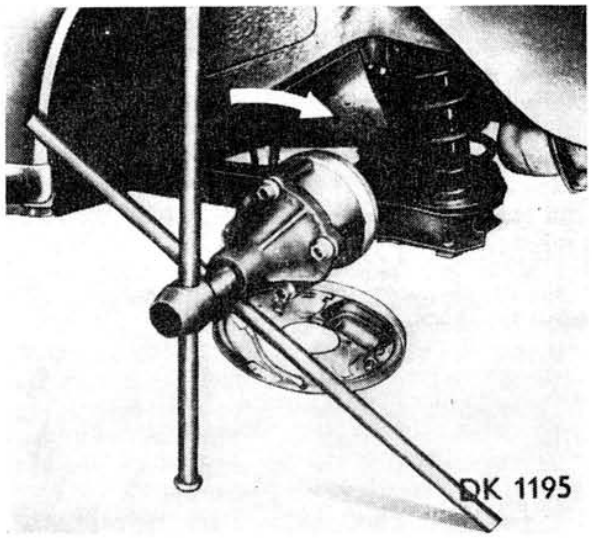


Fig. 5.1/3 - Forcing Shaft out of Bearing Using MP 5-113 Jigs and Jigs as per Fig. 5.1/1

The axle shaft may move out of the half-axle only to such an extent that the rear edge of the bearing thrust ring is flush with the half-axle socket. Otherwise it is apt to fall out of the epicyclic gear and its refitting would require the removal of the half-axle from the gearbox housing.

4. To fit a new ball bearing proceed according to Chapter 5.2. Pull out again the shaft slightly until the thrust ring can be seen, fit the bearing of the brake mechanism adhering to the instructions of the above-mentioned chapter, locate the bearing shim 0.3 mm thick, and complete the assembly.

Note: The 3 mm shim should be used only when replacing the wheel hub or when eliminating an ascertained shaft play, that is to say if the shaft moves axially and knocks. However, it is recommended never to use more shims than three.

5. A damaged sealing ring can be removed with a hook or a needle, and a new one driven or pressed-on. The latter alternative should be preferred with regard to the visual checking of the pressing-on operation. The tightening fin and spring of the packing have to be turned inside the half-axle.

When driving home the seal ring, slip the MP 5-114 pilot taper (see Fig. 5.2/3) on the shaft, smear it with oil, and move the sealing ring along it to drive it finally into the half-axle using the MP 5-116 drift as shown in Fig. 5.2/2.

For pressing-on the sealing ring, use the MP 5-112 jig (see Fig. 5.2/4) and the sleeve with taper as per Fig. 5.1/4. Pull the shaft slightly out of the half-axle, slip on it the oiled taper as shown in the illustration, then the sealing ring and finally the sleeve. Fasten the MP 5-112 jig screwing its head on the half-axle thread, slip the sealing ring on the thrust ring by means of the sleeve, and turn the wrench to press the sealing ring into the half-axle.

Now the bearing can be pressed on.

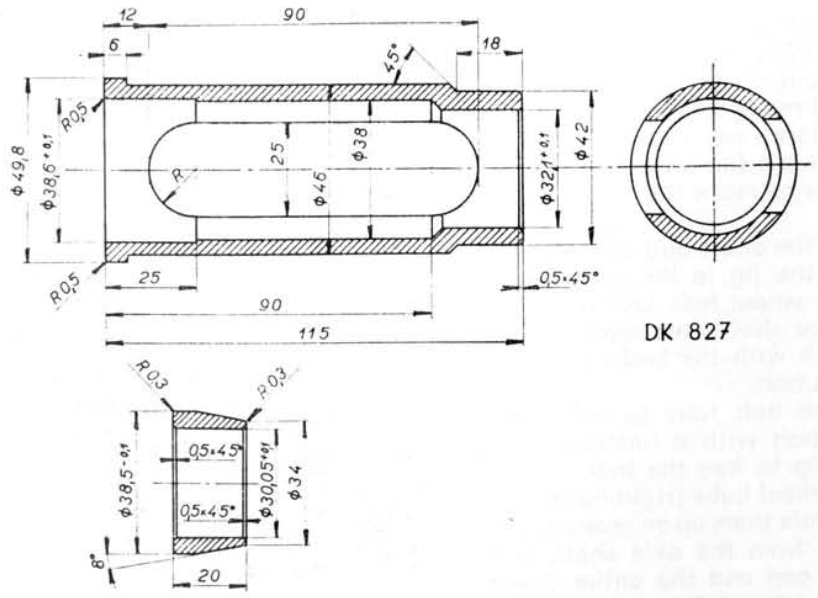


Fig. 5.1/4 - Sleeve and Taper for Pressing-on Halft-Axle Sealing Ring (taper surface smoothed out during manufacture)

5.2 ASSEMBLING HALF-AXLES AND RADIUS ARMS

Both the half-axles and radius arms are of right-hand and left-hand design. The differences in their appearance can be seen in Fig. 5/1.

1. Drive home the sealing ring into a thoroughly cleaned (inside) half-axle clamped in a vice.

Install the MP 5-114 pilot sleeve on the outer end of the axle shaft, smear the sleeve and the shaft thrust ring with oil, and thread the shaft through the half-axle.

2. Remove the pilot sleeve and replace it with the ball bearing. Rotate the handle of the centre bolt of the MP 5-112 jig after having removed from it all jig liners (two liners, one

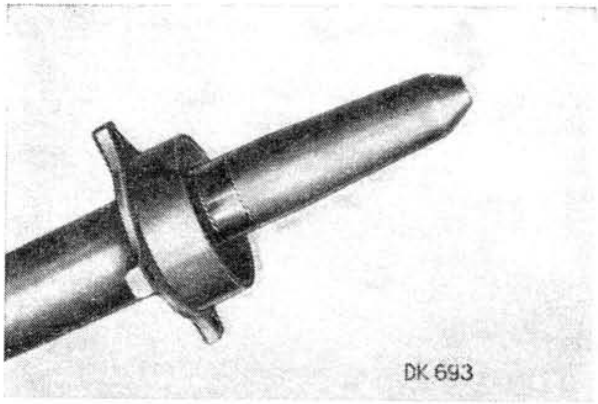


Fig. 5.2/3 - Installing Half-axle Shaft Using MP 5-114 Jig

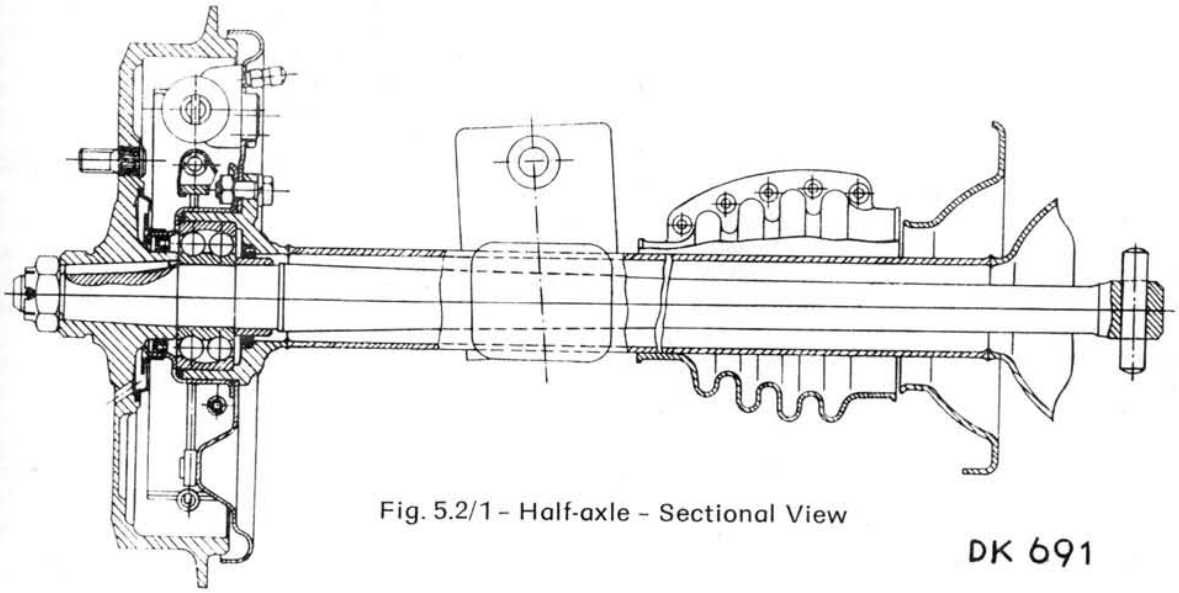


Fig. 5.2/1 - Half-axle - Sectional View

Fig. 5.2/2 - Driving Home Sealing Ring with the Aid of MP 5-116 Jig

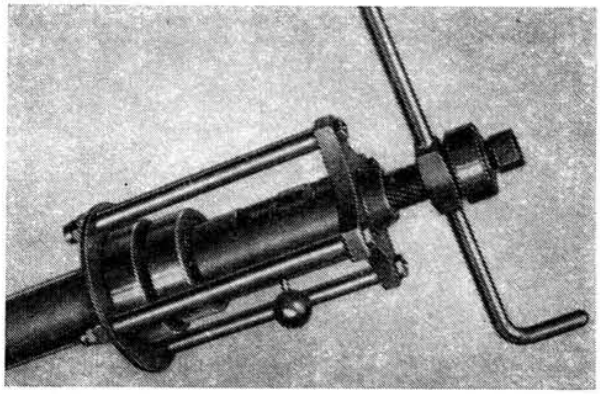


Fig. 5.2/4 - Pressing Ball Bearing on Shaft Using MP 5-112 Jig and Its Liner (larger)

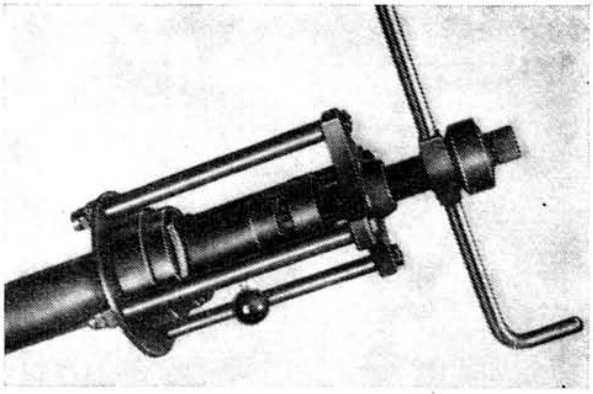


Fig. 5.2/5 - Pressing Ball Bearing on Shaft Using MP 5-112 Jig and Its Liner (smaller)

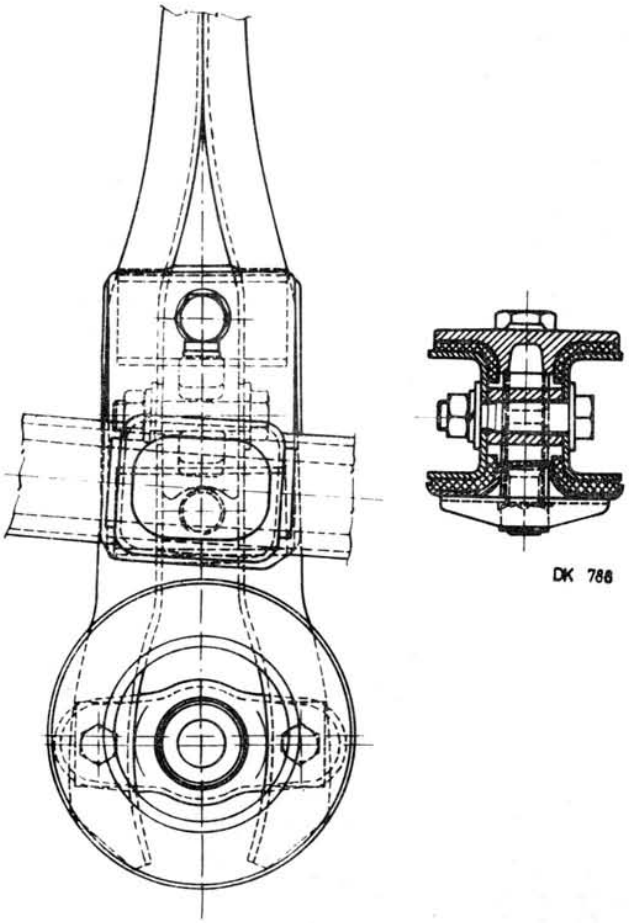


Fig. 5.2/6 - Connection of Half-axles with Radius Arms

larger and one smaller, and the forked plate), screw down the jig on the thread of the shaft, and use nuts to attach it to the half-axle socket flange. The jig of the latest design permits its simple fastening by engagement with the half-axle flange (fit the jig and rotate it to lock it in position).

Install the larger liner between the ball bearing and the jig head, and press the ball bearing on the shaft by turning the jig wrench.

3. Replace the larger liner with the smaller one (rest it against the jig bolt head), and turn the wrench in the opposite direction to press the bearing into the half-axle socket.

Fitting Brake Mechanism and Wheel Hub

4. Install the brake backing plate complete with the brake mechanism on the half-axle socket, slip on the "O" sealing ring and the cap with the sealing ring (with the tightening fin facing toward the half-axle), and fasten all the parts with bolts, spring washers, and nuts.

The sealing ring should be driven or pressed into the cap so that the tightening lip faces the bearing and just so that there remains a gap of 1 to 2 mm between the packing and the cap flange.

5. Insert the key in the shaft with its bevelled end into the runout of the keyway, smear the hub neck with oil so that it does not drag in the sealing ring, and fit the hub with the brake drum in position. Make sure that the key did not move further along the shaft (its lifted end in the keyway would cause the hub to burst) and tighten lightly the nut. Since a high torque is required for final tightening of the nut, put off the tightening and locking of the nut till after installation in the car. Then tighten the nut with full torque (see Chapter 1.8), tap on the hub to relieve the passive stress of the taper, retighten to the specified torque, and lock the nut with a cotter pin.

Fitting Radius Arms

6. Install the spacer into the radius arm, fit the knurled washers (with the knurling toward the arm) to either side of the elliptical holes of the radius arm, and fasten them with bolts and nuts not forgetting the spring washers. Do not tighten the connection fully. Thread the bolts through the bolt holes so that their nuts face into the car after fitting the radius arm to the half-axle.

Fit the radius arm on the protruding half-axle pin and thread the bolt through the hole of the seat. Slip spacing tubes on the bolt and pin together with sheet shims with rubber liners and fasten lightly (without tightening) the radius arm to the half-axle using nuts and lock washers. Tighten fully the connection after fitting the assembly in the car when adjusting the rear wheel alignment (geometry).

5.3 DISMANTLING HALF-AXLES AND RADIUS ARMS

Dismantling of the half-axles and radius arms presents practically no problems. Special instructions are required only for dismantling the ball bearing, and for them see the Chapter 5.1.

5.4 ASSEMBLING HALF-AXLES WITH AXLE HOUSING

1. Check the epicyclic gear for excessive backlash by inserting a guide block (prism). If the backlash is excessive, use oversize blocks exceeding the standard block by 0.1 mm.

Coat the pin of the axle shaft with grease and fit on it the guide blocks.

2. Unscrew the nuts securing the cover of the differential bearings, locate one paper gasket on the cover, and fit the half-axle and radius arm assembly on the bearing cover. Fasten the joint cowling by means of three bolts (120° spacing) and check the play of the joint by swinging the axle.

If the joint is too tight, fit an additional paper gasket.

3. Remove the nuts and use plain and spring washers to fasten joint (sheet) guards to all bolts. Rotate the half-axles with the wheel cylinders on top and fit the dust boots - for details refer to Chapter 5.6.

When attaching dust boots on an axle removed from the car, tighten the clips holding them down to the half-axle tube only after having refitted the axle into the car. In this way you will prevent their twisting.

5.5 REAR AXLE GEOMETRY - ADJUSTING

Radius arms are attached to the half-axles by clamping on rubber pads which provide for the possibility of a longitudinal movement of ± 5 mm. If the radius arms have been disconnected from the half-axles or if a new half-axle was fitted, it is necessary to align properly the rear axle with the front axle and to adjust the toe-in values of the rear wheels in accordance with Fig. 5.5/1.

The adjustment is a stagewise procedure:

a) alignment of axles
b) toe-in adjustment

Alignment of Axles

1. Chock the front wheels of the car and disconnect the half-axle from the radius arm by slackening the nuts (M 14) at the bottom of the seat and the nut (M 12) holding down the bolt in the elliptical hole of the radius arm. Back

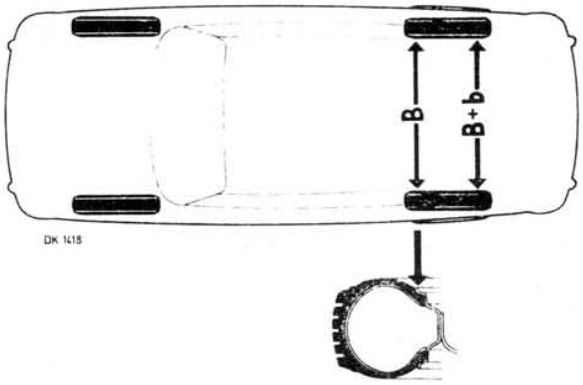


Fig. 5.5/1 - Rear Wheel Toe-in
$b = 0\ ^{+2}_{-1}$ mm with empty car

off the bottom nuts by about 5 mm until the radius arm rests freely on the rubber pad. Remove nave plates from the wheels or the complete rear wheels, and place roll-a-car jacks under the half-axles for easier handling.

2. Insert the tip of the MP 8-158 jig into the hole behind the jack holder on the underside of the car (these holes on either side of the car are parallel with the front axle) and fit the adjustable tip of the gauge rod into the centering recess of the half-axle shaft. Read off the distance on the gauge and compare it with the distance measured on the other side (using either two jigs or, if only one jig is available, moving it to the other side). The difference of the distances on the right-hand and left-hand side should not exceed 2 mm. To take basic measurements, move the half-axle to the centre of the elliptical holes in the radius arm by a blow with a rubber mallet.

Toe-in Adjustment

3. Proceeding in the same manner as when checking the toe-in of the front wheels, check

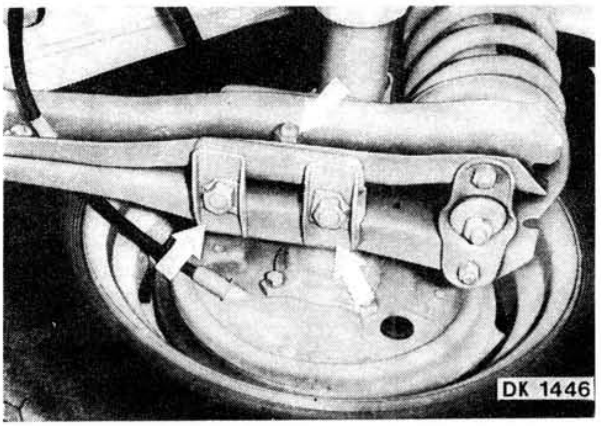


Fig. 5.5/2 - Loosening Connection of Half-axle and Radius Arm

the toe-in of the rear wheels using also the MP 8-152 gauge or another special gauge available in your workshop. To obtain the required shift of the half-axles (symmetrical so as not to disturb the axle alignment), strike again the half-axles with a rubber mallet as per paragraph 2.

4. Retighten the slackened connections (radius arm bolts) and, according to the progress of the reassembly, also the nuts of the half-axle shaft (see Chapter 5.2, paragraph 5). Complete the operation by locking the nuts.

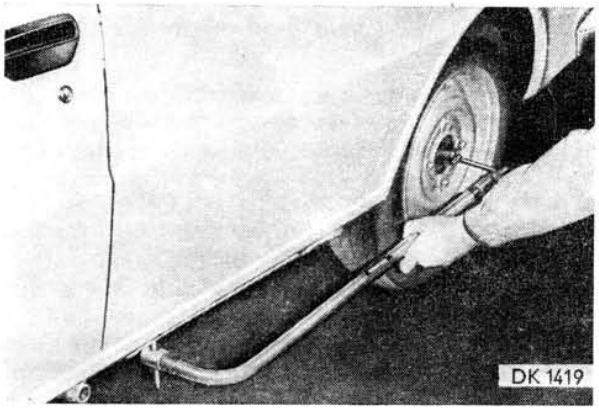


Fig. 5.5/3 - Checking Alignment of Rear Axle with Car Centre Line Using MP 8-158 Gauge

5.6 HALF-AXLE DUST BOOTS

To prevent oil from leaking through the joint gap between the dust boot and the joint guard as well as any twisting of the boot during the action of the road spring, or its damage by contact with other car parts, it is important to observe its correct position on the half-axle. It should be located with its flanges facing rearward and tilted upward at an angle of about 45°. For better access, place the clips fastening the dust boot to the half-axle and cover with their screws on top. With the right-hand boot, screw in the clip screws from the front, with the left-hand boot the screw on the half-axle from the rear and on the cover from the front.

Connect the dust boot flanges with hollow rivets using suitable pliers. If riveting pliers are not available, bolt the flanges together installing adequately dimensioned plain washers under the bolt heads and nuts.

5.7 HALF-AXLE SHAFT

The thrust ring of the bearing (behind the shaft taper) is pressed on the shaft. If it is necessary to renew this ring, for example after repeated replacements of the bearing (see Chapter 5.1, paragraph 4), press it on so that it is removed 76 to 78 mm from the edge of the taper behind the shaft thread.

6 - FRONT AXLE

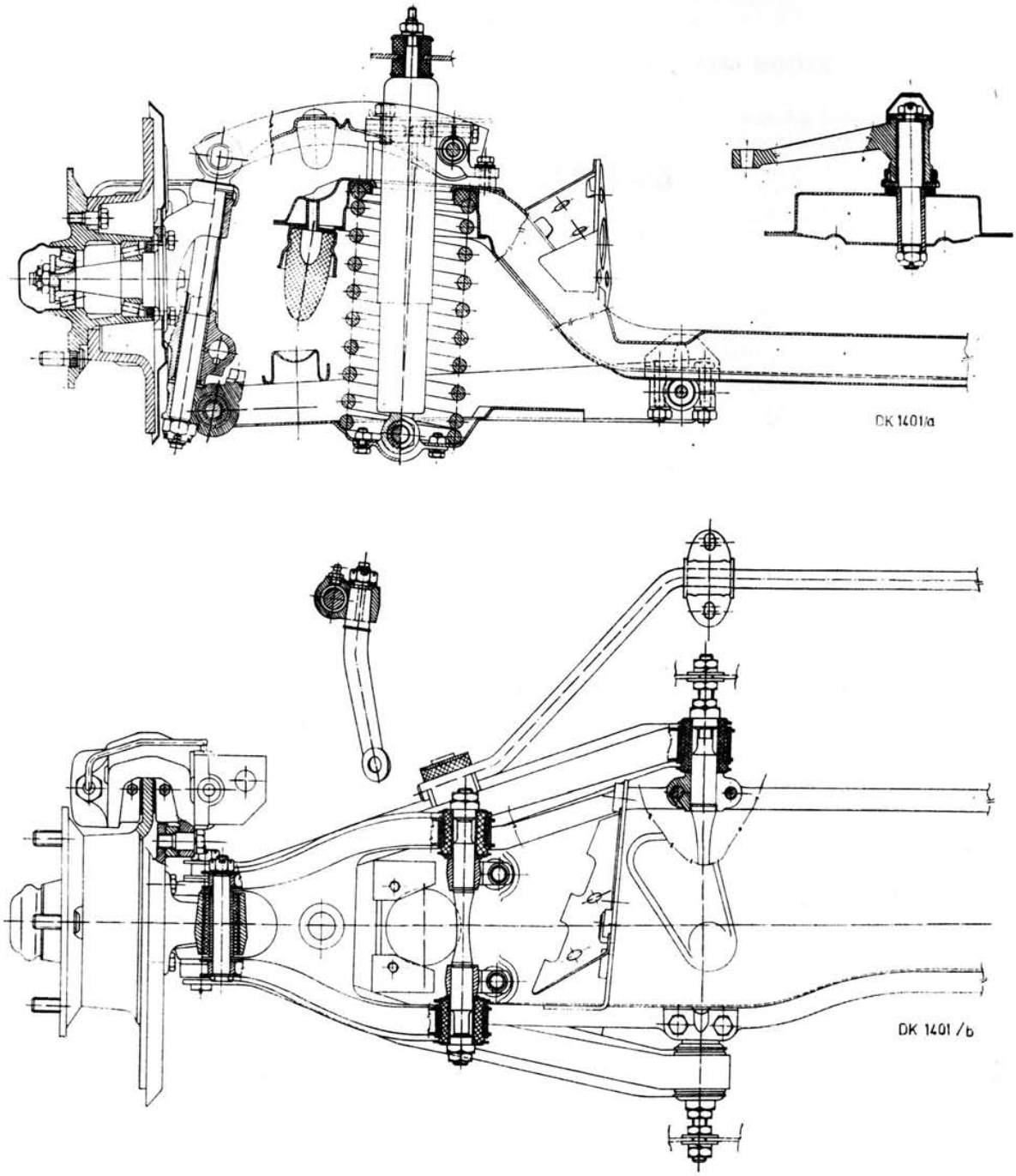


Fig. 6/1 - Front Axle - Sectional View of Half-axle and Steering Knuckle Arm

Technical Description

The front axle forms a separate and independent assembly unit which, supplemented with the steering box, the track rod, and steering rods and levers, is fitted direct into the car.

The swinging half-axles are formed by two pairs of arms of unequal length, the so-called wishbones, joint mounted on the axle body. Suspension is by coil springs and hydraulic telescopic shock absorbers, and an anti-roll bar prevents the car from rolling.

6.1 FRONT AXLE GEOMETRY (WHEEL ALIGNMENT)

At a check load:

- wheel toe-in	$2\ ^{+2}_{-1}$ mm
- wheel camber	1°15′
At full load:	
- castor angle	6°30′
- king pin inclination	7°30′

For checking the angles, the car has to be placed on level ground and its tyres must be properly inflated. During measurings, keep to all the specified data of car loading and all recommended procedures.

The specified values tend to change due to wear of the bearings of the steering knuckle and arms or due to a distortion of some parts of the front axle (not taking into account any distortions of the body) due to reckless driving, for example by striking the wheels against curbstones, and minor accidents. The camber angle and the king pin inclination are predetermined by the design of the front axle and its connection to the body. Besides these factors affecting the steering geometry, the king pin inclination changes automatically with any change of the castor angle. Therefore, the castor angle and king pin inclination values are only theoretical and informative figures.

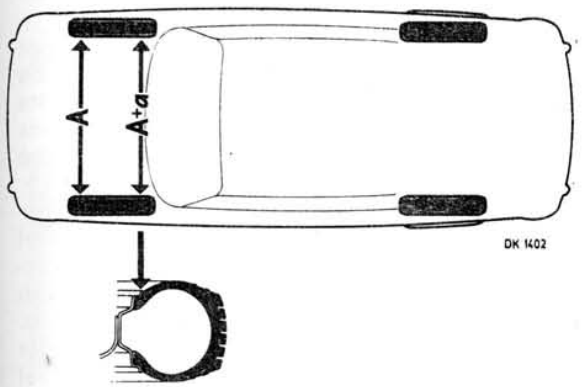


Fig. 6.1/1 - Front Wheel Toe-in

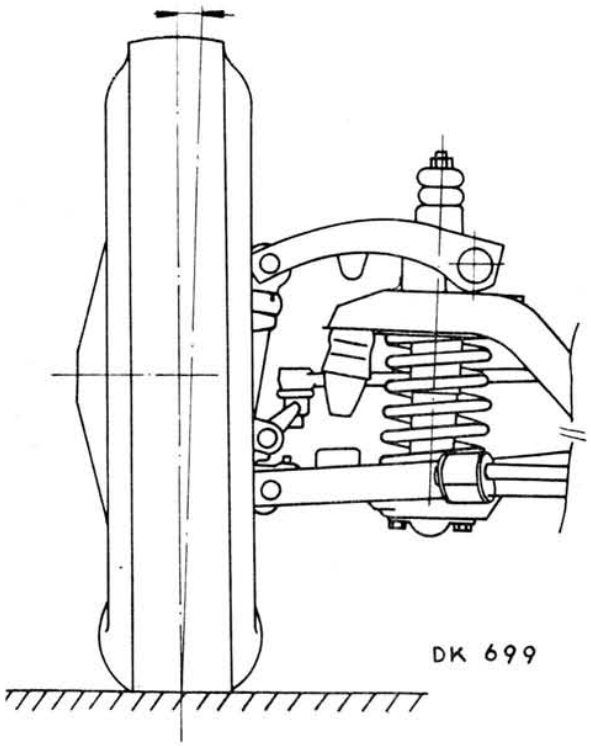


Fig. 6.1/2 - Camber Angle

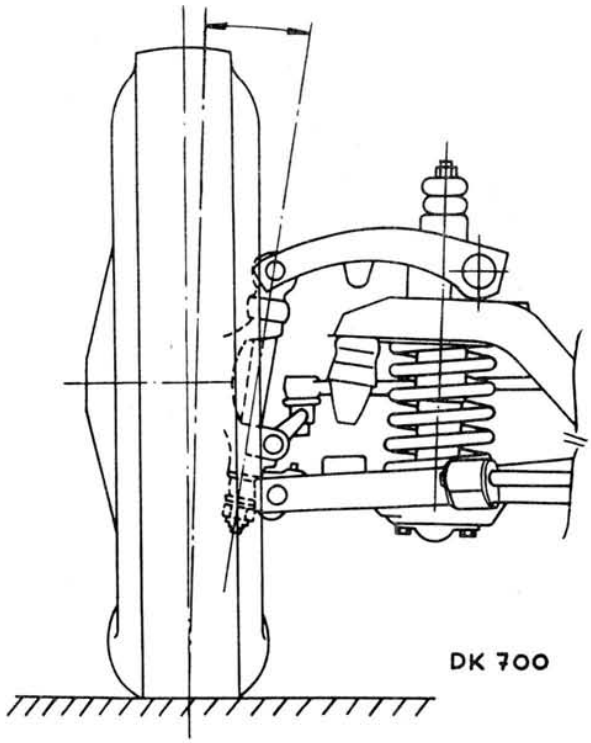


Fig. 6.1/3 - King Pin Inclination

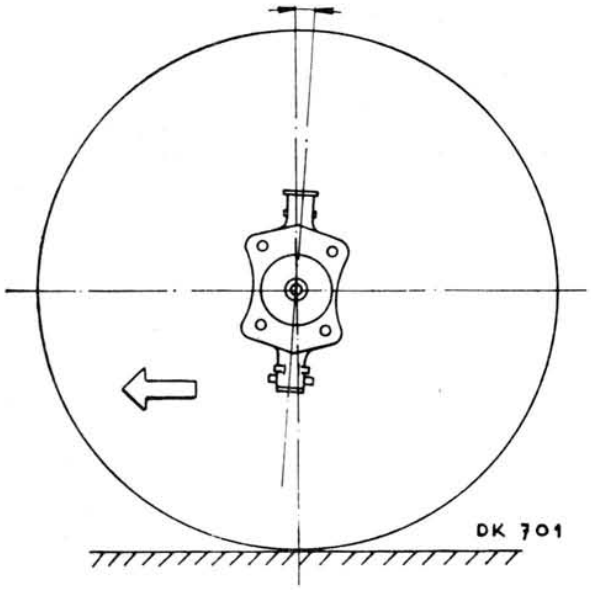


Fig. 6.1/4 - Castor Angle
It is imperative to set the angle with regard to the direction of forward travel as indicated by the arrow

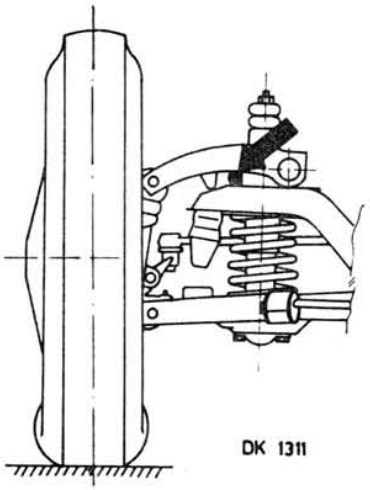


Fig. 6.1/5 - Preparing front axle for the condition of check load by inserting steel bars of 181 mm in diameter and about 220 mm long

The most important points from the point of view of driving are the toe-in and the camber angle, the adjustment of which is permitted by the axle design.

Adjust first the camber and then the toe-in since a changed camber affects the toe-in.

We refrain from describing in detail any measuring method in view of the large number of existing gauges. Instead, we advise you to refer to the procedures recommended by the manufacturers of the gauges.

The **check load** can be formed by blocking the wishbones with bars according to Fig. 6.1/5. Press down the car with the hand, insert the bars under the wishbones so that they bear against the axle bracket, and release the car to let the bars be clamped. If clamping of the bars does not take place (which can happen on an older car with weakened springs), consider the condition as if the bars were clamped, i. e., corresponding to the position of the front axle at check loading.

The words **"at full load"** describe a vehicle loaded so that the distance of the rubber dead stop from the bottom of the lower wishbone stop is 20 mm (see also paragraph 18) and the camber angle of the rear wheels is 1°. Measure these values on all wheels (not only one front and one rear wheel) and distribute the load as necessary.

Toe-in

To adjust the toe-in, screw the right-hand and left-hand steering rods symmetrically (a change up to 1 mm can be effected by one rod) at check load so that the distance between the wheel rims (or across them) behind the axle (A+a) is larger by the toe-in value (a) than the distance between the rims in front of the axle (A).

To verify steering symmetry (correct screwing of steering rods during toe-in adjusting), check the wheel lock position at the 20° lock angle of the nearside wheel - for the respective values refer to Chapter 1.7.

Slacken the steering rod nuts and rotate the steering rods using an alligator wrench (Fig. 6.1/6).

In addition to the correct inflation pressure of the tyres, pay attention to several essential points when checking the wheel alignment:

a) Place the wheel in the straight ahead travelling direction;
b) The steering rod and the track rod must not be stressed. The stress can be eliminated by letting the car swing up and down in its suspension under the pressure of your hands (alternately press down and release the wings);
c) Prepare the axle as shown in Fig. 6.1/5;
d) If a special gauge with a scale for wheel lock angle setting is available, adjust the correct length of steering rods in accordance with the position of wheels in check lock positions. You will find the respective values in Chapter 1.7 "Steering". Set the lock angle of the wheel on one side to 20° (on a turn-table) and screw the steering rod of the other wheel to adjust

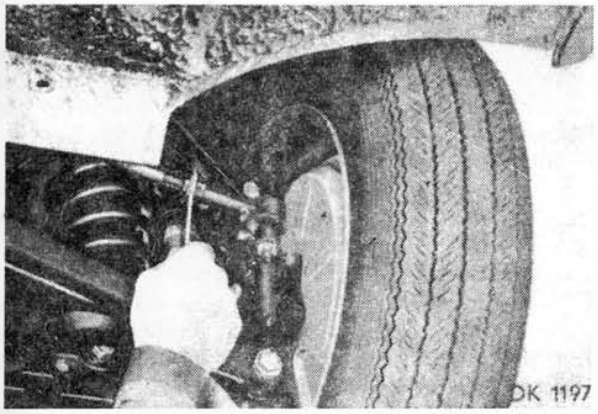


Fig. 6.1/6 - Adjusting Front Wheel Toe-in by Rotating the Steering Rods

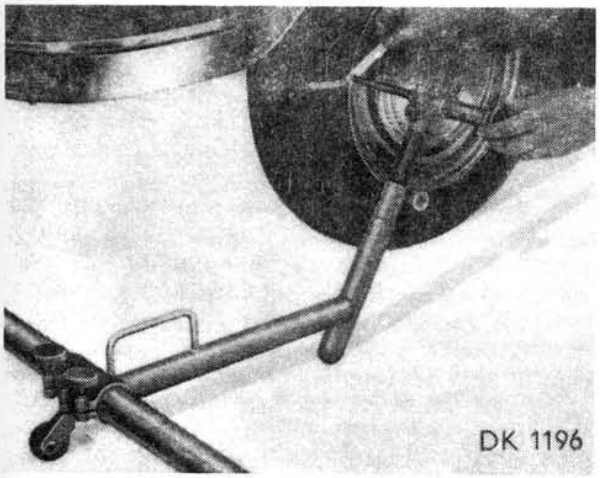


Fig. 6.1/7 - Checking Front Wheel Toe-in Using MP 8-152 Gauge

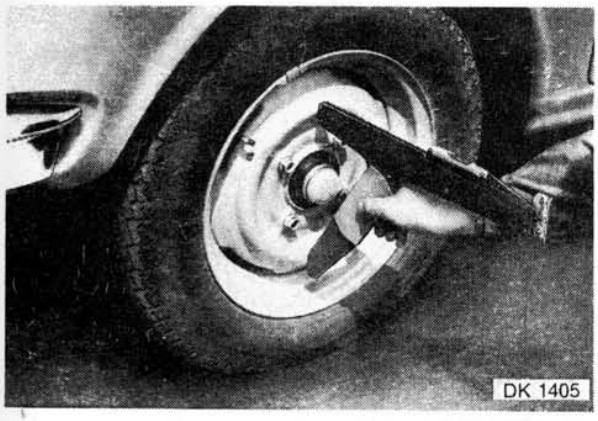


Fig. 6.1/8 - Checking Camber Angle Using MP 8-157 Gauge

its required angle. Proceed in the same way with the other wheel and recheck the wheel lock angles.

If the checking gauge is not made for this method of lock angle checking, adjust the toe-in and then check the action of the steering gear (linkage) with the wheels set in the maximum lock angle - the lock position must be limited by the stop on the king pin socket, not by the steering linkage, i. e. the steering must be resilient at the lock angle limit.

e) When measuring the toe-in by means of a mechanical rig (gauge) shown, for example, in Fig. 6.1/7, observe also the following condition:

Take the measurements (both in front and behind the axle) always at the same point of the rim. Mark with chalk the point of contact of the gauge (e. g., behind the axle), push the car so as to turn the wheel through 180°, and take the other measurement at the same (marked) point in front of the axle. Thus you will avoid an error likely to occur with an out-of-round wheel rim. Read the measurement on the gauge head scale. Check the clearance between the gauge contact point (tip) and the wheel rim with the aid of cigarette paper.

Wheel Camber

When measuring the camber angle with a mechanical gauge, for example according to Fig. 6.1/8, hold the gauge on the rim in the perpendicular position, mark the point of contact, and measure the camber. Push the car to turn its wheels through 180° (to eliminate any error due to the rim out-of-round), measure again the camber at the marked points, and take the average of the measurements as the resulting camber angle.

To correct the camber angle, use the eccentric pin at the joint of the bottom wishbone and king pin socket. For the basic adjustment, the axle has to be removed from the car. For details see Chapter 6.5, paragraphs 33 and 34.

The value of 1°15′ given in the front axle geometry table at check load is a theoretical camber which can be still considered correct if it does not exceed the tolerance limits of ± 30′. It should be adjusted to 1°15′ ± 15′. Then proceed with adjusting the toe-in.

6.2 REMOVING FRONT AXLE FROM CAR

a) Operations outside the car

1. If the car has travelled with the axle a certain higher number of kilometres (total distance travelled or the distance from the last removal of the front axle from the car), for

example 50,000 km and more, check the wheel camber and prepare suitable washers for its correction.

2. Jack up the car and support the body on both sides to relieve the front wheels, and remove the wheels.

3. Proceeding from inside the luggage boot, remove covers protecting the threads of the shock-absorber piston rods and screw off the nuts. Retain the piston rod by holding its flattened end.

b) **Operations inside the car**

4. Remove the steering wheel, the steering column cowling, and detach the steering shaft from the body - see Chapter 7.8.

c) **Operations from under the car**

5. Remove the bolt of the connection of the steering shaft with the steering box and release the shaft sleeve from the connection by pulling the steering gear inside the car.

6. Slacken the nuts of the bottom wishbone pins fastening the front axle to the bracket on the body until the washers of the brackets are released.

7. Detach the anti-roll bar brackets from the body and disconnect the rubber brake hoses from the front brake systems. Before disconnecting the hose, clean thoroughly the hose connector and its surroundings to prevent foreign matter from getting into the brake system. For the same reason, wrap the hose ends in a clean rag. Take the same precautions with the disconnected brake piping.

8. Place a roll-a-car jack under the axle and remove the bolts (two on either side of the telescopic shock absorber) fastening the axle to the body from above.

9. Compress the telescopic shock absorbers, lower the jack, and move it with the axle from under the car.

6.3 REFITTING FRONT AXLE IN CAR

1. To reinstall the axle in the car, reverse the procedure of its removal, i. e., begin with the paragraph 9 and proceed to the paragraph 1. Coat the rubber cup with grease at the point of its contact with the steering shaft.

2. While reconnecting the brake hoses, observe the utmost cleanliness and bleed the front wheel brakes if no other parts of the brake system has been dismantled. (If such a dismantling has taken place, bleed the brakes of all wheels after having fully reclosed the brake circuit).

3. Turn the wheels in the straight ahead direction before connecting the steering shaft with the steering box. Fit the steering wheel tentatively and adjust the direction indicator switch - see Chapter 13.17.

4. Using the steering wheel, turn the wheels into full lock positions to make sure that the lock angle is correctly limited by the king pin socket stops - see Chapter 6.5, paragraph 36.

5. Adjust the toe-in - see Chapter 6.1.

6.4 DISMANTLING FRONT AXLE

No special instructions are required for dismantling many of the subassemblies. Accordingly, only the basic dismantling procedure will be dealth with and particulars will be mentioned only as far as they are necessary for the sequence of operations and the use of jigs.

Parts which can be dismantled without removing them from the car are the wheel hubs and bearings, the brake mechanisms, steering arms, shock absorbers, and the anti-roll bar.

If any additional parts have to be dismantled, remove the axle from the car and dismantle it on the stand.

Dismantling Wheel Hubs and Bearings

1. Dismantle the brake mechanism as per Chapter 9.1 and remove the wheel hub cap using the MP 6-124 drag. When using the MP 6-136 pull-off cartridge, the hub cap has to be prised off with a tyre lever or a similar tool. Now remove the castellated nut with its washer and pull out the hub, assisting the removal with light blows of a mallet, if necessary.

2. Take out the inner part of the outer bearing, then the sealing ring, and, finally, the inner part of the rear bearing (cone with tapered rollers). Prise out the sealing ring using a screwdriver. Proceed carefully along the ring circumference to avoid distorting the ring which

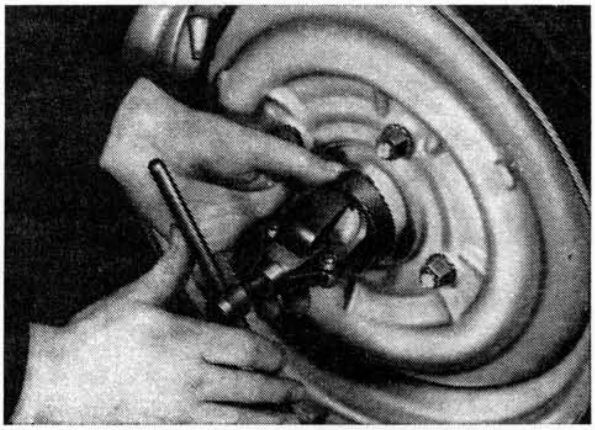


Fig. 6.4/1 - Removing Hub Cap Using MP 6-124 Drag

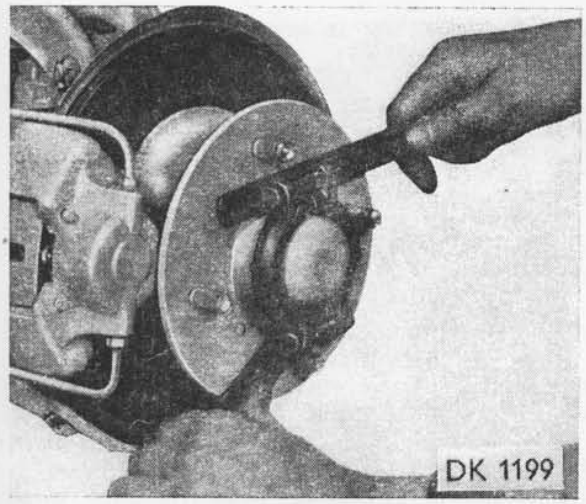


Fig. 6.4/1a - Prising off Hub Cap Using MP 6-136 Cartridge

will be reused on reassembly. Sometimes, when pulling out the wheel hub, the inner bearing and the seal ring stick on the steering knuckle. To remove them, use the MP 6-126A drag.

3. Place the wheel hub with the cup of the outer bearing on a support plate and use the MP 6-129 drift to press out the cup. Using the other end of the drift, press out the cup of the rear (inner) bearing.

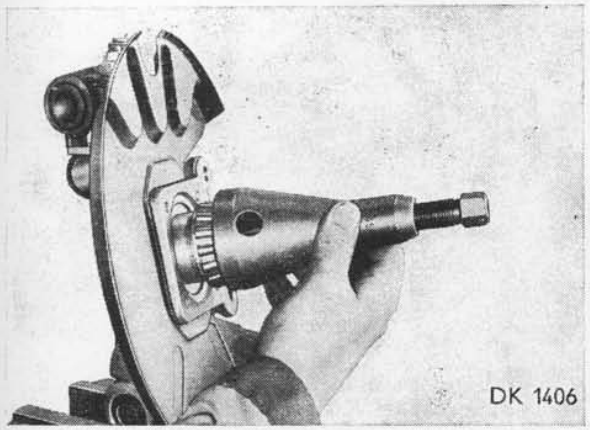


Fig. 6.4/2 - Pulling Off Tapered Roller Bearing Cone Using MP 6-126A Drag

Dismantling Steering Linkage

Screw off the castellated nuts of the joint ball pins and press out the pins with the MP 6-104 drag. Slip the jaws of the drag under the rubber cups of the pin with the utmost care to avoid damaging the cups (oil the drag).

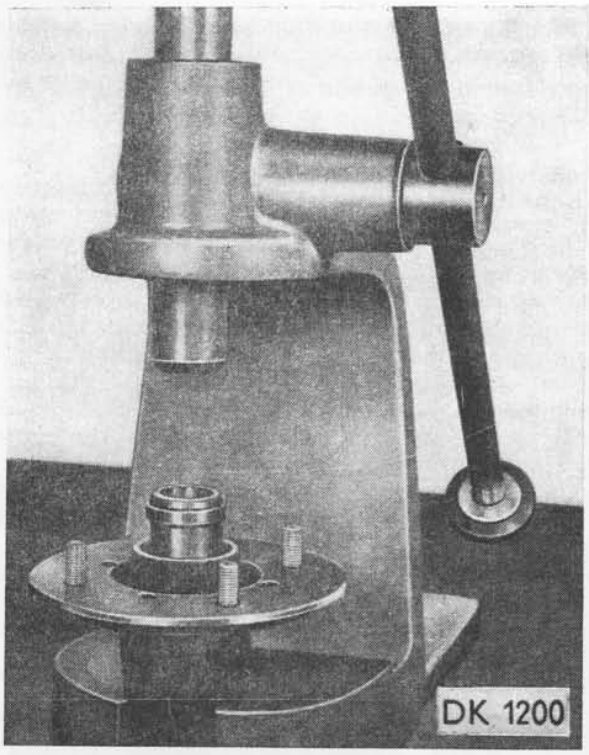


Fig. 6.4/3 - Pressing Out Tapered Roller Bearing Cup (larger) Using MP 6-129 Drift

Fig. 6.4/4 - Pressing Out Tapered Roller Bearing Cup (smaller) Using MP 6-129 Drift

Remove the castellated nut and washer from the steering arm, screw down the MP 6-105 catridge on the thread of the arm, and drive out the arm.

Removing Steering Knuckles, Springs, and Wishbone Suspension

1. Remove the shock absorber and fit the MP 6-106 spring installer in its place from above. Install a horseshoe washer on the spherical end of the installer tie-rod passing through the coil spring and the bottom wishbone, and compress partly the spring (for fitting the installer see Fig. 6.5/4).

2. Screw off the castellated nuts of the upper wishbone pin and the bolt of the lower wishbone suspension, and drive out the wishbone pin. If driving out is impossible, use the MP 6-107 drag (remover).

Rotate slightly the flanges of the drag to break it up in two parts, fit it as a yoke over the upper wishbone, clamp it in position by rotating its head, and screw in the centre bolt to press out the wishbone pin.

3. Drive out the bolt of the lower wishbone suspension and remove the steering knuckle from the lower wishbone.

4. Screw off the nut of the king pin and pull off the king pin socket using the MP 6-111 drag.

Refer to the following chapters for further dismantling of the steering knuckle, the king pin and its socket, and their repairs.

Having removed the spring installer, lift away the spring and remove the wishbones.

5. When removing the upper wishbone, mark the thickness of the open (horseshoe) washers inserted between the bracket and axle body on the individual brackets. The washers are 3 mm and 1 mm thick so that if there are, for example, one 3 mm and two 1 mm washers, mark the thickness of 5 mm on the bracket. Also take into account the likely necessity of a correction of the washer thickness - see Chapter 6.2, paragraph 1.

When reinstalling the upper wishbone, fit washers of the marked down thickness to simplify the adjustment of the wheel camber.

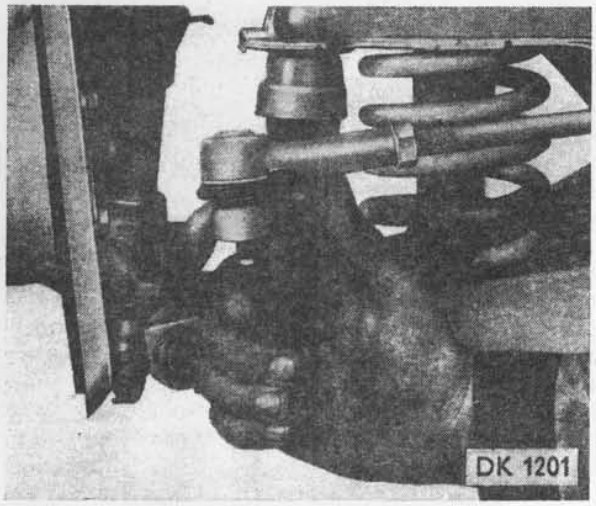


Fig. 6.4/5 - Pressing Out Pins of Steering Ball Joints Using MP 6-138 Drag

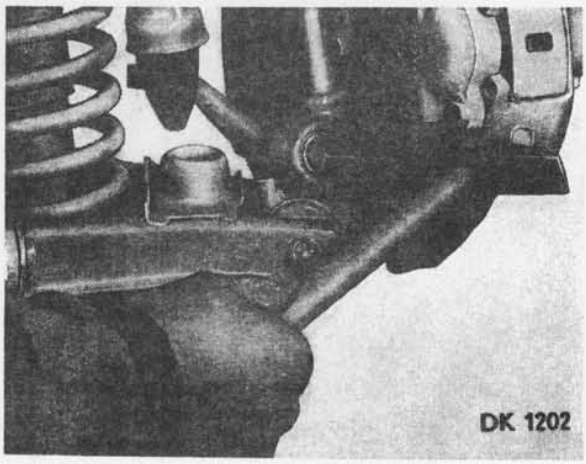


Fig. 6.4/6 - Driving Out Steering Arm Using MP 6-105 Cartridge

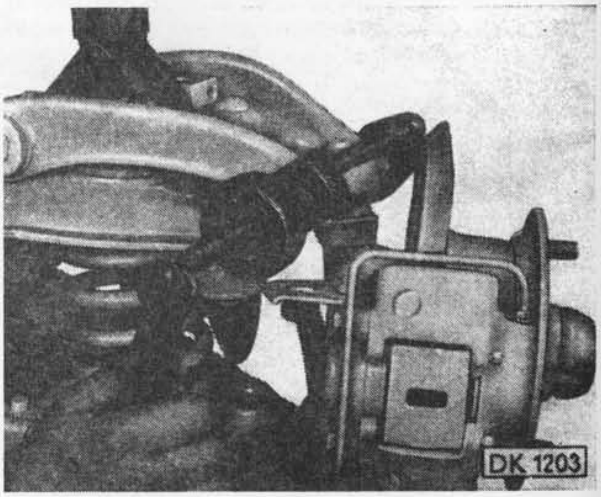


Fig. 6.4/7 - Pressing Out Upper Wishbone Pin Using MP 6-107 Drag

6. Remove the nuts of the wishbone pin, clamp the eye of the wishbone and bracket in a vice (see Fig. 6.5/3) and use a screwdriver to push the circlip out of the groove to the narrowed down part of the pin. Slip the pin out of the other eye of the wishbone and push out also the other circlip.

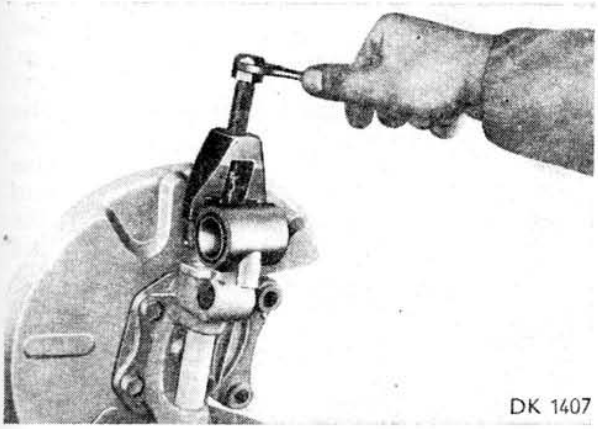


Fig. 6.4/8 - Removing King Pin Socket Using MP 6-111 Drag

Holding the circlips in pliers, slip them off over the narrowest part of the wishbone pin and remove the pin.

6.5 REASSEMBLING FRONT AXLE

The reassembly depends on the extent to which the front axle has been dismantled. To provide the completest information, the sequence of the assembly operations and some points of particular interest are given in the following text.

Axle Body and Fitting of Steering Relay Lever

1. Clamp the axle body in the MP 9-101 stand completed with the proper MP 6-101 clamping plate and insert the rubber dead stops (lower wishbone stops) into their respective cups.

2. Insert the pin of the steering relay lever, screw down the castellated nut, and lock the nut with a cotter pin. For the tightening torque see Chapter 1.8.

3. Install the washer, the relay lever with oiled bushes, and another washer on the pin and tighten the assembly with a nut. If the lever has no play, add one or two adjusting washers (shims) 0.1 mm thick to adjust a play which will permit the lever to rotate freely.

Remove the lever, fit a rubber washer under the bottom washer and refit the washer. Smear the washer and the pin with grease. Slip the plastic cover ring on the bottom pin of the lever and pack the gap between the ring and the lever with grease. Likewise fill with grease the gap between the lever bushes and smear grease on the walls of the bushes.

Fit the lever on the pin, slip on it the previously selected adjusting washers, tighten the castellated nut, and lock it with a cotter pin. Refer to page 117/118 for testing tension.

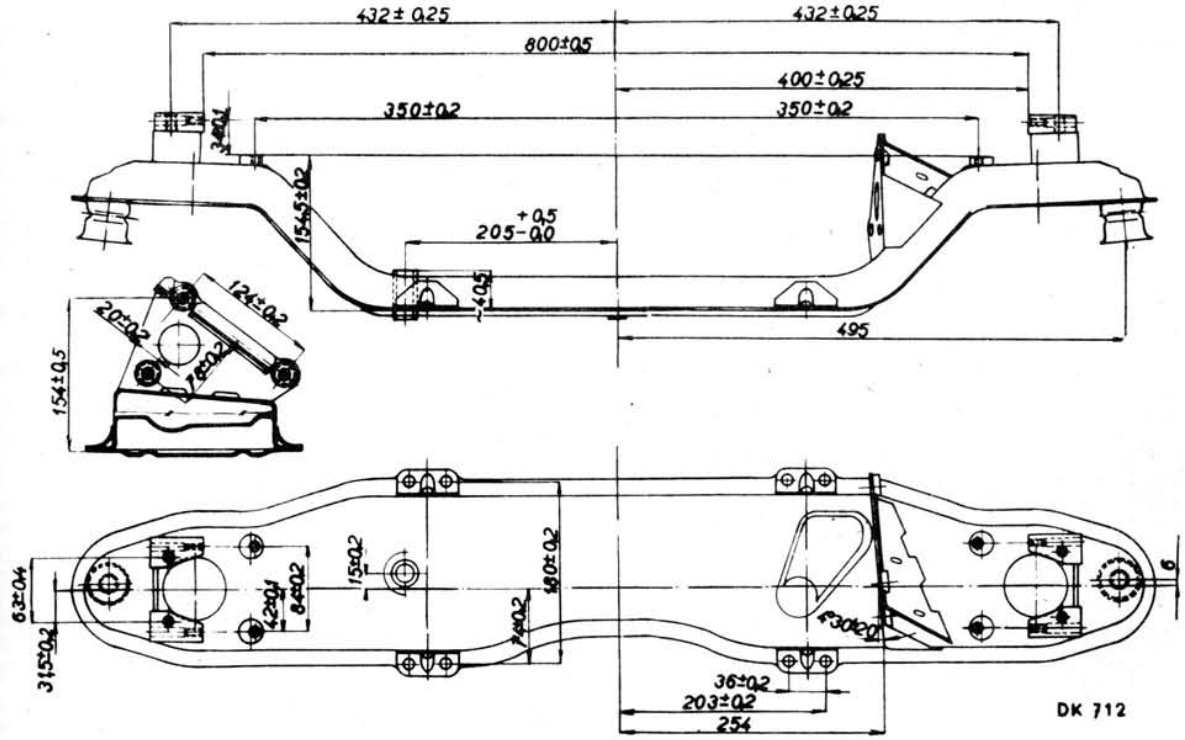


Fig. 6.5/1 - Axle Body - Dimensional Drawing

Pack with grease the plastic dust cup and press it over the nut till it snaps home in position on the lever.

Refitting Upper Wishbones

4. When refitting wishbones which have been already used in the car and which are rather doubtful (for example, a distortion is suspected as a result of a crash), inspect them carefully and straighten them, if necessary.

5. Press rubber bushes into the eyes from the outer side. To facilitate their sliding in, dip them in petrol or soap water (suds). Put the bushes into the wishbone eyes with their larger diameter first and push them so far that they protrude from the eye by the same length on either side. Blow off the soap water with compressed air so that it does no assist the slipping of the bush during the next operation.

6. Slip the spacing tube on the MP 6-122 drift, dip the drift in petrol or soap water, and, forcing it through the rubber bush, press the spacing tube into the bush.

Before pressing it in, turn the spacing tube so that the joint of the packaged bush faces the top side of the wishbone.

7. Thread the wishbone pin through the eye, slip on it the cup with its dished part facing the bush, two wishbone brackets with the lugs pointing away from the wishbone, and the other cup with its dished part toward the other rubber bush, and thread the pin through the other eye.

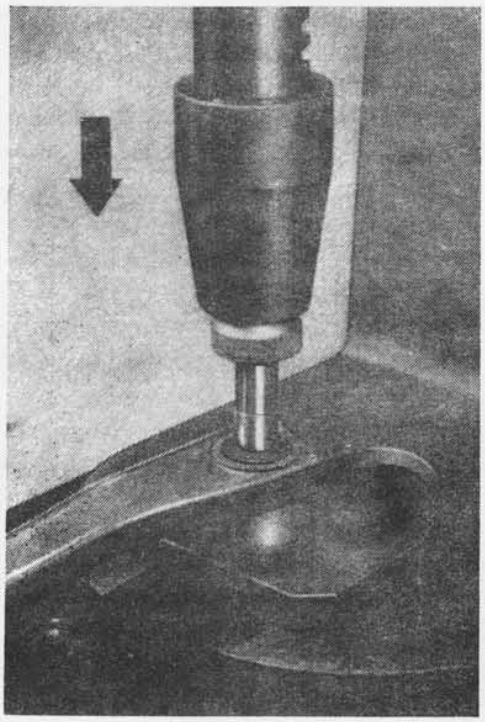


Fig. 6.5/2 - Pressing Spacing Tube into Rubber Bush Using MP 6-122 Drift

8. Push the brackets towards the eyes and slip two circlips on the narrowest part of the pin. To slip them on, hold them with their unconnected ends on the pin and press down. Use a screwdriver to move one of the circlips into the groove of the pin, and push the pin with the circlip in position into the bracket. Clamp the other bracket with the wishbone eye in a vice to compress the rubber bush, and slip on the other circlip.

9. Insert the rubber dead stop into the wishbone.

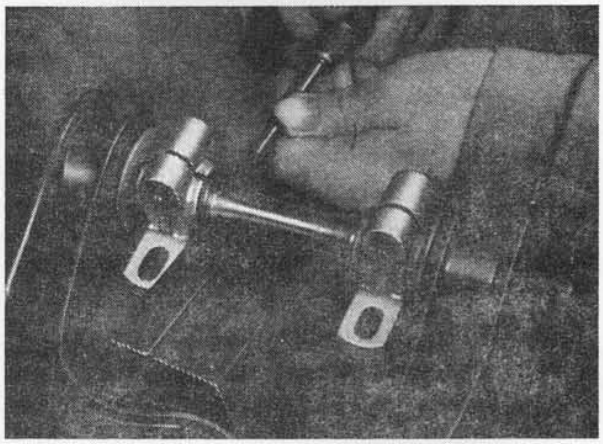


Fig. 6.5/3 - Installing Circlip into Pin Groove

10. Reinstall the two assembled wishbones on the axle body. Fit a plain washer under the spring washers of the lug bolts. Install, from above, one 1 mm or one 3 mm open (horseshoe) washer or the previously removed washers on the horizontal bolts between the bracket and the axle body lug.

First tighten the horizontal and then the vertical bolts.

Fit the cups on the wishbone pin and screw down both nuts.

Refitting Lower Wishbones

11. Inspect the wishbones as per paragraph 4.

Insert rubber bushes in the eyes of the wishbone from its inner side. Thread the wishbone pin through the eye, slip on it the cup as with the upper wishbone, then two pin holders with the recesses at the inner hole facing each other, another cup, and complete the operation by threading the wishbone pin through the other eye.

12. Slip circlips on the wishbone pin and lock with them the wishbone brackets in position. Proceed in the same manner as with the upper wishbone (paragraph 8).

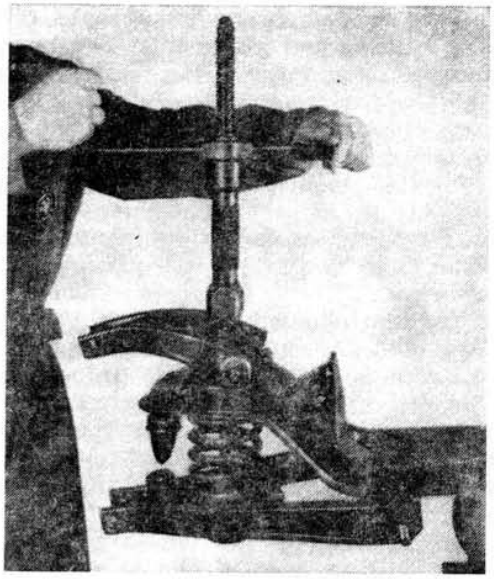


Fig. 6.5/4 - Compressing Coil Spring Using MP 6-106 Installer

13. Assemble the other wishbone in the same manner (paragraphs 11 and 12) and install both wishbones one the axle body. Slip the bolts in their holes from above, and install spring washers under the nuts. There is the right-hand and the left-hand wishbone distinguished by anti-roll bar brackets which have to be fitted on the front parts of both wishbones.

14. Fit spacing tubes into the wishbone eyes with their joints on top. By screwing down the shouldered nuts of the pins, force the spacing tubes into the eyes as far as they will go.

15. Remove the nuts of both arms to fit rubber bushes into the lower wishbone eyes from outside. Fit bush cups on the shoulders of the nuts and tighten the nuts lightly.

Refitting Coil Springs

With regard to production tolerances, the coil springs are classed into two different groups according to their weight. For one car use coil springs of the same weight class according to the Table in Chapter 8.1.

16. Apply rubber cement to one coil spring end and stick the rubber pad on it so that the end of the coil rests in the recess. (This sticking-on of the rubber pad precludes a displacement of the pad along the spring during assembly, but it is by no means a must.)

17. Swing down the lower wishbone, fit in it the end of the spring without the pad so that it rests in the recess of the wishbone, and install the other end of the spring in the axle body after swinging up the wishbone.

18. Place the MP 6-106 spring installer on the axle body and fit the open washer on the spherical end of the installer tie-rod, passing through the spring and the lower wishbone. Now compress the spring so that there is a distance of 20 mm between the rubber dead stop and the bottom of the lower wishbone stop.

This position of the wishbone corresponds with its position in the fully loaded car, and it is used when pulling off rubber bushes from the wishbones and when adjusting the front axle geometry.

Refitting Steering Knuckle c/w King Pin and Socket

19. Dip the two plastic friction rings (washers) in oil and fit them on the king pin with pressed-on resilient bush. Slip the rubber cup over the rings and fit it into the groove of the king pin.

20. Smear with oil the king pin and insert it into the steering knuckle. Put the oiled rubber sealing ring into the groove next to the king pin bottom bush.

Slip a friction ring dipped in oil (the same as under the king pin socket) on the pin, and press on the king pin socket with its resilient bush, but not fully.

Be careful not to mix up the steering knuckles which are of the right-hand and left-hand design, and only the king pin is the same - see Chapters 6.6 to 6.8. Make sure that the king pin sochets are correctly aligned. Do not omit to turn the king pin so that the longer part of its socket with the resilient bush faces the grease nipple on the steering knuckle.

21. Refer to page 117/118 for tensioning procedure.

Refitting Wheel Hub

22. Press tapered roller bearing cups into the hub with pressed-in wheel studs.

Use the MP 6-130 jig for this purpose. Pack the space between the bearings with grease, and remove excessive grease with the aid of a wooden spatula drawn along the bearing cups.

Install the cone of the inner (rear, larger) bearing packed with bearing grease and tap home the sealing ring soaked in oil, preferably hot. Use the MP 6-131 installer (drift).

Before refitting an already used sealing ring, try it by fitting it on the wheel hub. If it is too wide (slack), use a new one.

Complete the wheel hub refitting by installing the brake friction disk. Lock the bolts with spring washers.

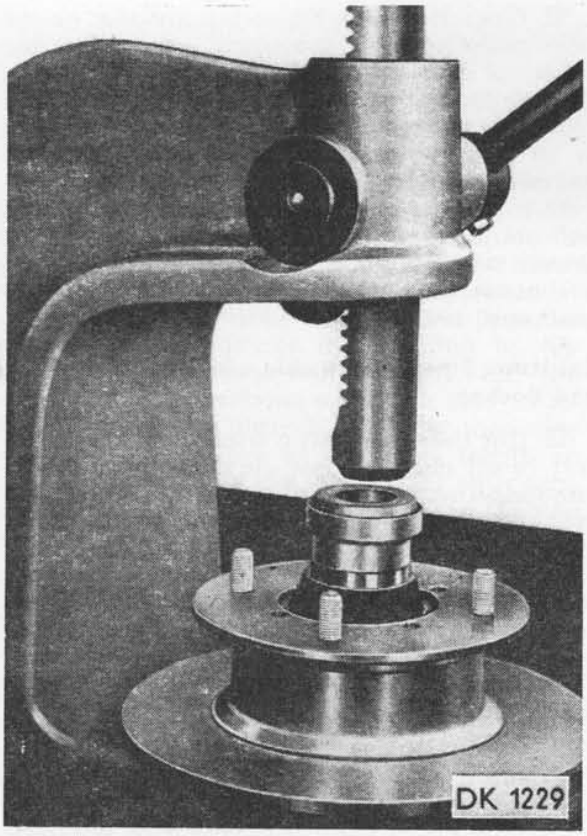


Fig. 6.5/5 - Pressing-in Bearing Cups Using MP 6-130 Jig

Fig. 6.5/5 - Installing Sealing Ring Using MP 6-131 Jig

23. Fit the disk brake back plate on the steering knuckle and fasten it by bolting down the brake bracket. Use spring washers to lock the bolts. Drive home the wheel hub on the steering knuckle with light taps and use a tube to tap home the bearing cone.

24. Fit the grease-packed cone of the outer bearing on the steering knuckle, locate the shim on the bearing, and tighten the nut with a torque of 1.5 kpm (15 Nm) while rotating the wheel hub.

25. Tap the wheel hub and the brake disk with a mallet and rotate the wheel hub to bed in the bearings. Back off the nut through about 180° and retighten it with a torque of about 5 Nm (0.5 kpm) while rotating the hub. Then back off the nut to the nearest cotter pin slot (at the most through 30°), and lock it in this position by inserting the cotter pin.

26. Check whether the wheel hub rotates freely but without any noticeable clearance in the bearings, and secure the nut with the cotter pin.

Fitting Steering Knuckles and Wheel Hub into Wishbones

27. Having thus assembled the wheel, install it into the lower wishbone, fit a shim between the wishbone rear eye and the resilient bush in the king pin socket, thread in the eccentric pin, and screw down the nut without tightening it.

28. Press the wheel against the upper wishbone and connect it with it by tapping home the wishbone pin from the rear side of the axle, i. e., from the side of the shorter part of the king pin socket. Slip the MP 6-108 pilot pin on the wishbone pin thread to facilitate threading of the pin through the hole in the wishbone. Tighten slightly the connection with the castellated nut.

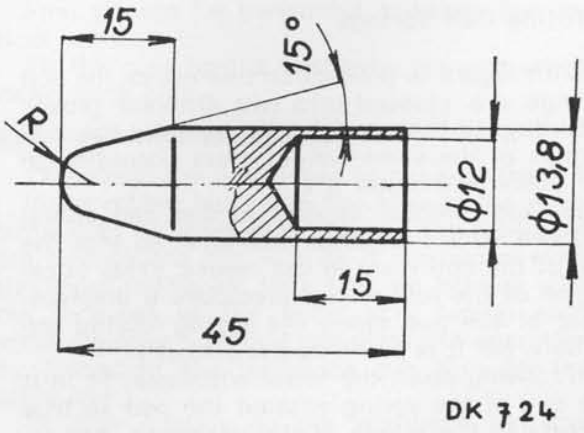


Fig. 6.5/7 - MP 6-108 Pilot Pin for Upper Wishbone Pin Installation

29. Now measure the distance of the brake bracket eye to the brake disk. Using shims 1, 0.5, 0.3, and 0.1 mm thick, adjust this distance to 19±1 mm in accordance with Fig. 9.2/1 and install the brake. Put spring washers on the bolts. To facilitate this operation, it is advisable to remove first the brake shoes and to refit them after having set the said distance.

30. Insert the key into the keyway in the hole for the steering arm (in the steering knuckle) and fit in position the steering arm while retaining the key with a needle or a length of wire. After having slipped a washer on the thread of the steering arm, screw down the castellated nut and lock it with a cotter pin.

The steering arms are of the left-hand and righ-hand design. They must be turned with their deflection (outbend) towards the centre of the axle.

Assembling Steering Gear

31. For the acutal assembly of the steering gear and linkage, refer to the section STEERING.

Install the steering box while putting spring washers under the bolts. Turn the steering screw (shaft) approximately to the centre so that the steering drop (pitman) arm is approximately midway of its travel.

32. Check the length of the steering rods and connect the steering linkage (arms) with the track rod and steering rods. Tighten slightly the castellated nuts of the ball pins.

Adjusting Camber Angle

33. Fasten the arm of the MP 6-123 or MP 6-139 gauge on either side of the axle body and the plate of this gauge to the wheel hub. Turn the eccentric pin in the bottom connection of the wheel with the wishbone with the groove marked on its head downwards so that the groove is opproximately parallel with the centre line of the king pin, and tighten the connection. Operating the steering screw and screwing symmetrically both steering rods, place the road wheels so that all contacts (contact points) of the gauge arm touch the plate, and then read off the camber angle on the scale of the gauge arm.

34. Proceeding according to Fig. 6.5/9, adjust the camber angle to 2°. It is advisable to adjust first the angle roughly with the aid of shims and to use the eccentric pin for the final adjustment with a maximum deviation of 0°8′ to 0°10′.

It is important to observe this rule so that there remains the greatest possible eccentricity of the pin for a later correction of the camber angle.

A shim 1 mm thick changes the camber angle by 0°17′30″, a 3 mm shim by 0°52′30″ (theoretical values). When using the eccentric pin (with all eccentricity available), the camber angle can be changed within the range of ±0°18′.

Preliminary Toe-in Adjustment

The described procedure serves for rough adjustment of the toe-in saving tedious setting when the car is ready for operation as well as for checking the corect assembly of the steering gear.

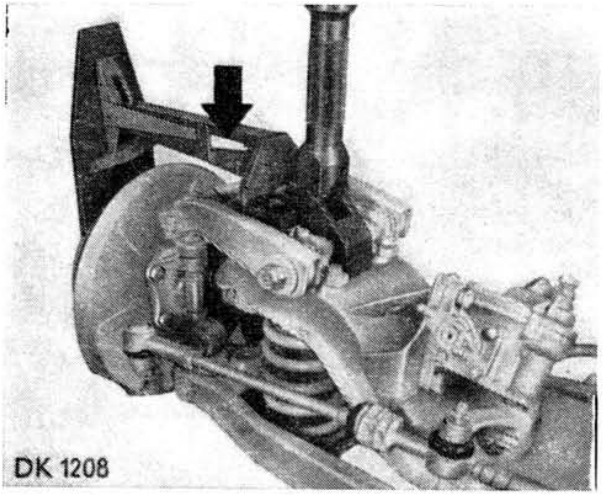


Fig. 6.5/8 - Checking Camber Angle Using MP 6-123 or MP 6-139 Gauge (with compressed road spring as per par. 18)

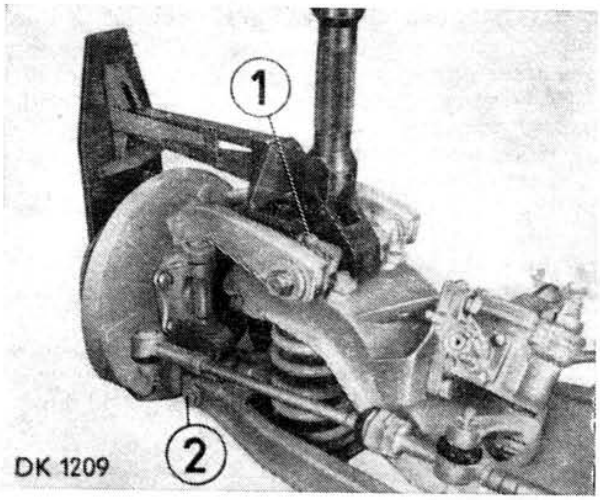


Fig. 6.5/9 - Adjusting Wheel Camber by Inserting Shims Between Axle Body and Upper Wishbone Bracket (1) and by Turning the Eccentric Pin in King Pin Socket (2) by Its Protruding Head

35. Using a measuring rod on which the distances can be marked with a line, measure the distance between the gauge plates when turned forwards and rearwards (the plates must be approximately horizontal). By turning both steering rods, adjust the road wheels so that the distance between the plates behind the axle is 3 mm larger than the distance in front of the axle, and lock the steering rods in this position by means of nuts.

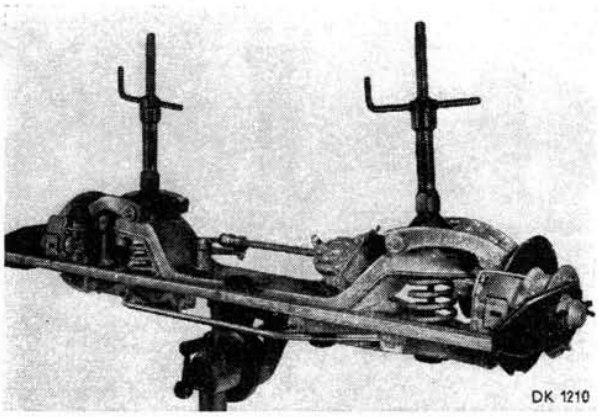


Fig. 6.5/10 - Measuring Front Wheel Toe-in

36. Rotate the steering screw to check the correctness of the steering gear reassembly. With the wheels in the right-hand and left-hand lock position when the steering knuckle abuts against the boss on the king pin socket, both extreme positions in the steering box must be resilient, without any hard impacts.

If this is not the case and there is a hard impact, correct the adjustment by shortening one steering rod and lengthening the other one.

37. Having adjusted the camber angle and the toe-in, retighten

a) the nuts of the eccentric pins and lock them with cotter pins
b) the nuts of the upper wishbones and lock them with cotter pins
c) the bolts of the upper wishbone bracket
d) the nuts of the upper wishbone pins and lock them by tightening the thin nuts
e) the nuts of the lower wishbones and lock them by tightening the thin nuts
f) the nuts of the ball joint pins (ball pins).

For tightening torques see Chapter 1.8.

38. Recheck the wheel camber, remove the gauge, and screw down loosely nuts and washers on to the protruding ends of the lower wishbone pins in the following order: thin nut, spring washer, two plain washers, another spring washer, and a thin nut.

Fitting Anti-roll Bar

39. Slip rubber bushes on the centre part of the anti-roll bar (close behind the oblique bend) and fit on them the holder. After having threaded the other rubber bushes on the ends of the anti-roll bar, install it in the brackets on the lower wishbones, and lock it in position by clamping the rubber bush by another holder. Secure the bolt of the holder with a spring washer.

Reinstalling Shock Absorbers and Completing Front Axle Reassembly

40. Using the spring installer release the road spring and then remove the installer. Fit the shock absorber holder to the shock absorber eye and connect them with a bolt with a castellated nut. Lock the nut with a cotter pin.

Thread the shock absorber through the lower wishbone and the coil spring and fasten it with bolts and spring washers.

41. Fill the wheel hub cap with the recommended grease and drive it home in the hub. The grease will penetrate into the bearing and lubricate it. Use the MP 6-125 drift to avoid damaging the cap.

42. Screw down a grease nipple on the bottom bearing of both king pins and lubricate the entire axle with the recommended grease.

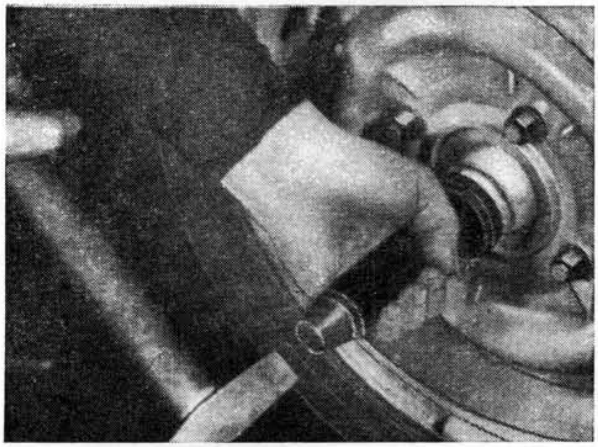


Fig. 6.5/11 - Driving-on Wheel Hub Cap Using MP 6-125 Drift

6.6 STEERING KNUCKLE

The steering knuckle is a unit formed by the swivel pin, the brake back plate bracket and guard, special self-lubricating bushes, and the spacing tube. The right-hand and left-hand steering knuckle can be identified by the grease nipple or nipple hole which must face forwards.

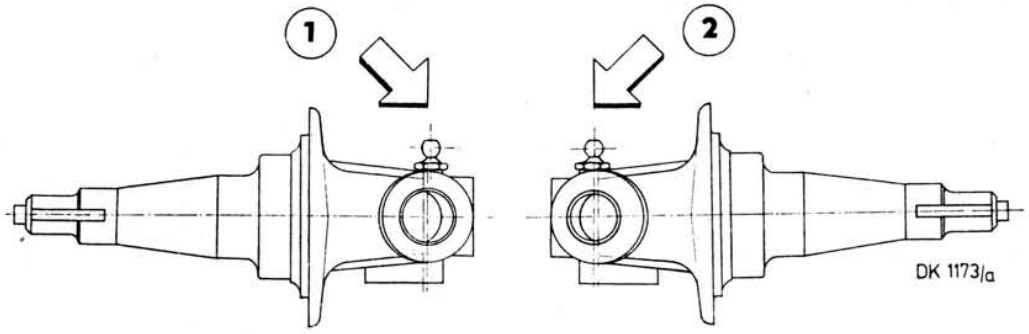


Fig. 6.6/1 - Steering Knuckle
1 - left-hand, 2 - right-hand

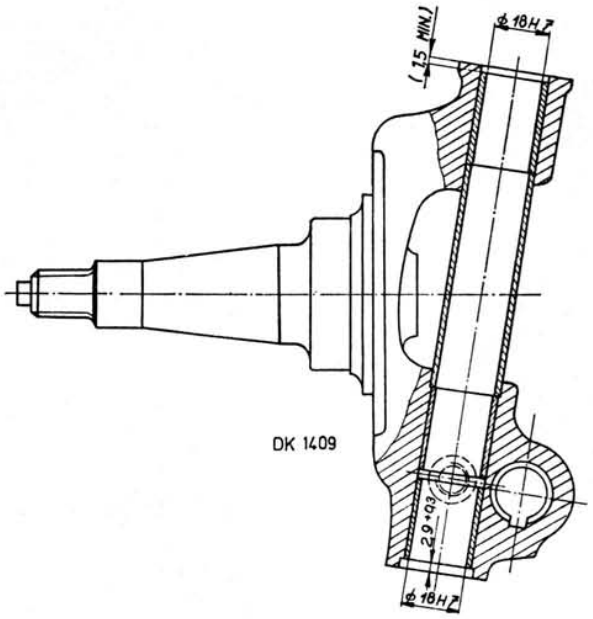


Fig. 6.6/2 - Steering Knuckle
Dimensions for pressing on the bushes and their machining

Replacing Bushes

Using the MP 6-135 pressing mandrel, press out the spacing tube and the top bush through the bottom bush.

If this method cannot be used, cut out the tube and press out the bushes from the outer ends.

When replacing the bushes with new ones, press the spacing tube into the pin within the entire dimension of the lower shoulder using the MP 6-135 pressing mandrel. Use this mandrel also for pressing the bush into the upper part of the pin till it bears against the spacing tube.

Press the first lower bush into the lower part till the spacing tube is firmly clamped. This clamping ensures the required watertightness of the connection. To check it, press in the upper bush as far as it will go. Then press in the other bush flush with the recess for the sealing ring or to the dimension shown in Fig. 6.6/2.

Use the MP 6-114 reamer for reaming the bushes.

Dimensional Correlation of King Pin and Bushes

Bush inside diameter	18+0.018
King pin diameter	18–0.006 –0.017
Clearance at maximum king pin and bush wear	0.4

6.7 KING PIN

The king pin is formed bodily by the pin and its resilient bush. For pressing the bush in and out, use the MP 6-112 mandrel.

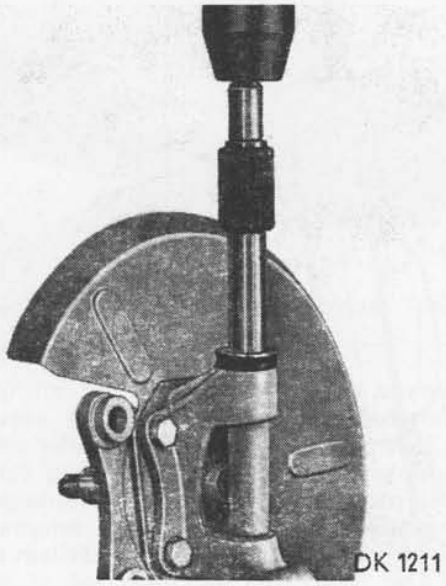


Fig. 6.6/3 - Pressing in and out King Pin Bushes Using MO 6-135 Pressing Mandrel

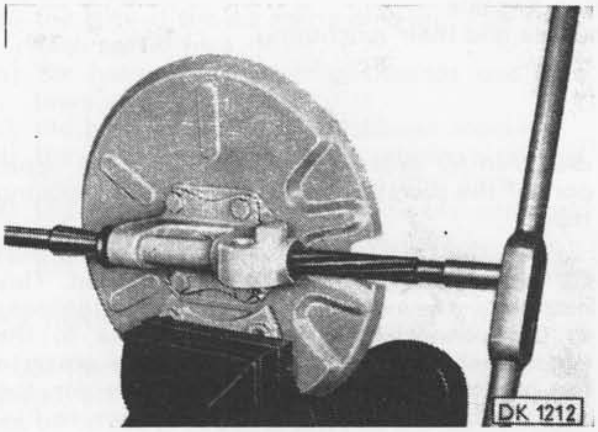


Fig. 6.6/4 - Reaming King Pin Bushes Using MP 6-114 Reamer and its Pilot Taper

The cylindrical surface of the king pin cannot be reconditioned. Grinding or any other machining is apt to destroy its special surface finish. When worn, the king pin must be replaced with a new one.

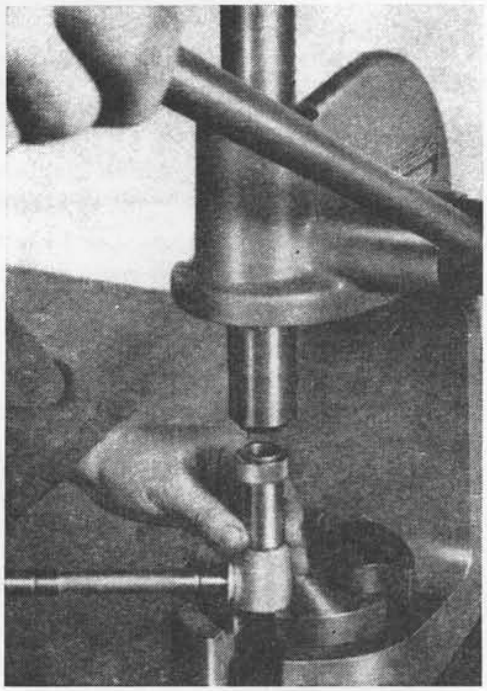


Fig. 6.7/1 - Pressing-in of King Pin Resilient Bush Using MP 6-112 Mandrel

6.8 KING PIN SOCKET

It consists of the socket itself and the resilient bush. For pressing the bush in and out, use the MP 6-112 mandrel as in the case of the king pin bushes.

The right-hand and left-hand socket can be identified by the relative position of the hole for the king pin and the chamfering of bosses limiting the wheel lock positions.

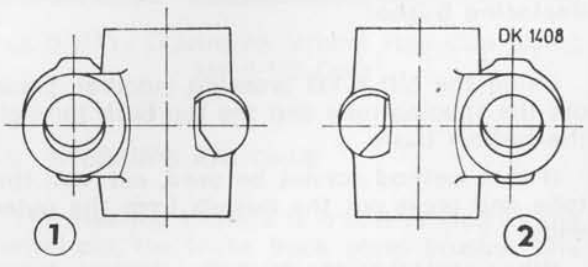


Fig. 6.8/1 - King Pin Socket

1 - left-hand, 2 - right-hand

STEERING ADJUSTMENTS

NOTES:

A) The vehicle is to be in a wheel free attitude.
B) The forces given are maximums unless stated.
C) Operate all systems several times before testing.
D) Leave wheels on hubs for all tests.

Tools required: Spring balance 0 - 4kg or 0 - 7lbs
Track Rod End Extractor
Depth Gauge

Complete the following operations and tests in order until the force requirements are met.

1. Turning force for Stub Axles – Workshop Manual Ref. 6.5.21. Disconnect the Track Rod ends from the Stub Axle; release the lower kingpin nut 3 turns, ensure lower trunnion slides down kingpin; lubricate kingpins with a molydisulphide grease ensuring lubricant appears at both top and bottom thrust washers. Fit a 0.05mm (0.002 ins) feeler gauge between the top thrust washer and kingpin head; tighten kingpin nut until feeler is pinched; remove feeler and tighten kingpin nut between 1 and 1¾ flats.

Using the Spring balance, pull on the stub axle at the attachment point of the track rod joint. Pull at 90° to the arm.

Maximum permitted force 1.8kg 4lbs.

Insert new split pin and secure.

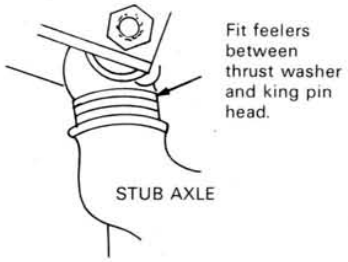
2. Turning force for Box, Column and Idler. The maximum force required to move these components by pulling with the Spring balance on the junction of the Steering Wheel Rim and Spoke, at right angles to the Spoke is 1.27 kg 2.75lbs over 1½ turns of wheel.

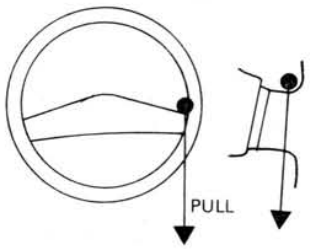
Ignore the initial force if within ¼kg ½lb of average force.

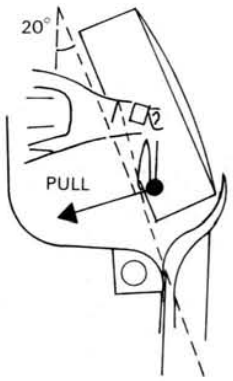
3. Top up Steering Box. Using 70ccm of Shell spirex EP140 with 3ccm of a molydisulphide additive (molyslip). If the box has previously been filled, add just 3ccm of additive.

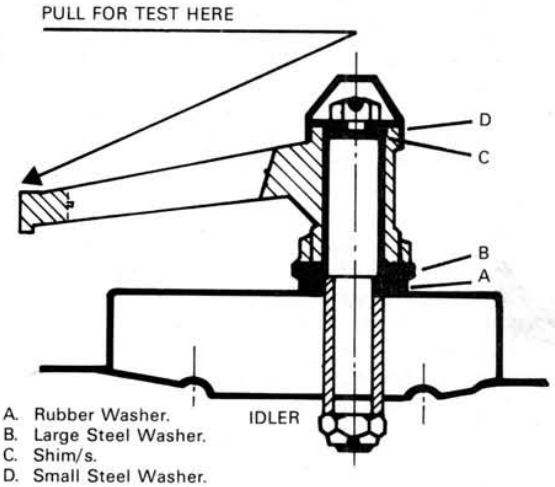
If the vehicle now complies with requirements 1, 2 and 3, refit track rod ends; fit new split pins and check turning force of system as directed in (2); maximum permitted force on the spoke is 2.4kg 4.5lbs.

TOTAL TIME ALLOWANCE 60 mins.









A. Rubber Washer.
B. Large Steel Washer.
C. Shim/s.
D. Small Steel Washer.

PART 'B'

If the vehicle does not comply with (2) remove the drag link joint from the Steering Idler (Transfer lever).

4. Steering Idler. The maximum force required to turn the idler by pulling at right angles to the drag link point is 0.9kg 2lbs. If excessive, remove the idler and the large rubber washer, under the idler, and refit the idler without the large rubber washer. Measure and adjust the idler end float with feelers 0.02mm – 0.12mm, adjust using shims Part No. 110 509654. The idler should move freely. Reassemble idler with rubber washer after lubricating.

TIME ALLOWANCE 15 mins.

5. Turning force of box and column only. The maximum permitted turning force of the box and column only (drag link attached to steering box but allowed to slide freely across idler) is 1.2kg 2.5lbs when test is carried out as in (2). If the force is excessive, lubricate universal joints and check that the drag link assembly is free to move. Repeat test. If still excessive remove the steering box, which can be removed with the track rod still attached.

TIME ALLOWANCE 5 mins.

6. Turning force to rotate Steering Box input shaft. With some form of coupling (coupling from 'S' type Steering Box) test the force required to rotate the shaft; maximum prmitted torque 0.16kg 1.16ft lbs. If using an arm and spring balance as shown the maximum force required can be calculated by

$$\frac{160}{\text{arm length in cm}} \qquad \frac{1.16 \times 12}{\text{arm length in inches}}$$

These tests should be carried out with the worm in the central position. The initial force will be 0.25 kg ½lb greater than the average pull-force. If excessive, remove input shaft top bearing cap and adjust the bearing to give 0.00 to 0.05mm preload.

Shim Part No. 110-509650 Steel 0.3mm
110-590900 Paper 0.2mm
110-590902 Paper 0.7mm

Refit the shims and gaskets and retaining cap, fit the rubber sealing ring dipped in oil and fit the thin dust cover. If the dust cover seems strained, install a paper gasket between the cap and dust cover. Part No. 110-590900.

Retest for torque and check rocker shaft end float which should be between 0.4 and 0.5mm. If excessive and unable to adjust by the adjusting bolt, replace steering box *after* contacting the Service Department.

Reassemble car and check the maximum permitted force at the spoke is 2.4kg 4.5lbs. Check that the wheel and indicator switch is centralised.

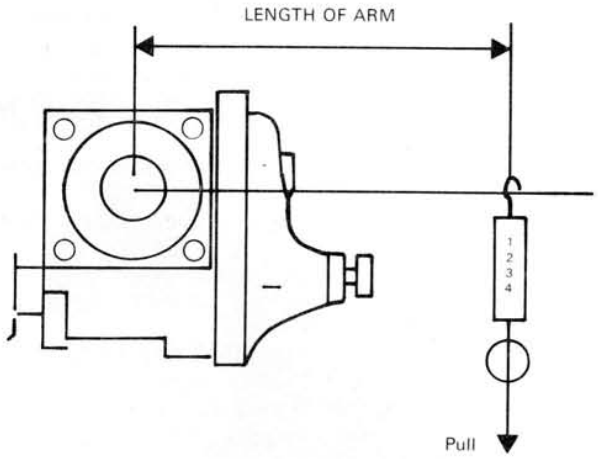
Rocker Shaft Nut Torque 100Nm (71 lb ft).

TIME ALLOWANCE 70 mins. (includes cost of additional shims)

7. Other points which can adversely affect the turning force of the Steering mechanism:

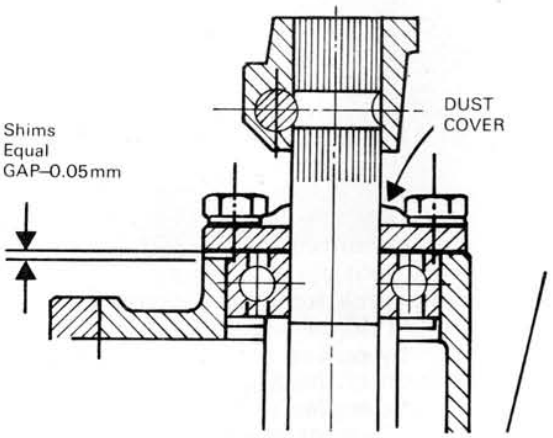
a) excessive tension of the ball joints.

b) **Workshop Manual 7.5.5.** excessive tension of the drag link arms. The force required to move the arm should be approximately 2kg or 4.6lbs when applied to the inboard end of the threaded portion.



e.g. with length of arm 6 inches max. permitted force equals $\frac{1.16 \times 12}{6}$

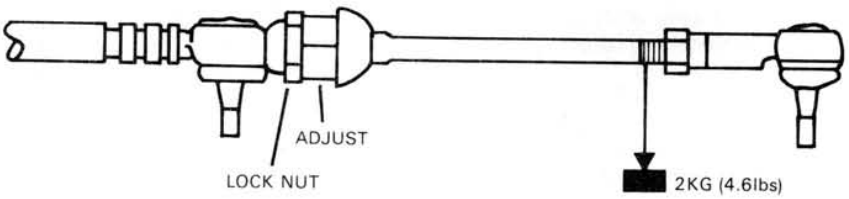
= 2.32lbs



TIME ALLOWANCE – Off Vehicle 10 mins.

If problems are experienced with wheel vibration on the front axle it is necessary to check the amount of weight applied to one half of the wheel rim which should not exceed 50 grams.

You are reminded that check A1, kingpin adjustment, is required to be carried out at each of the six and 12,000 mile services.



7 - STEERING

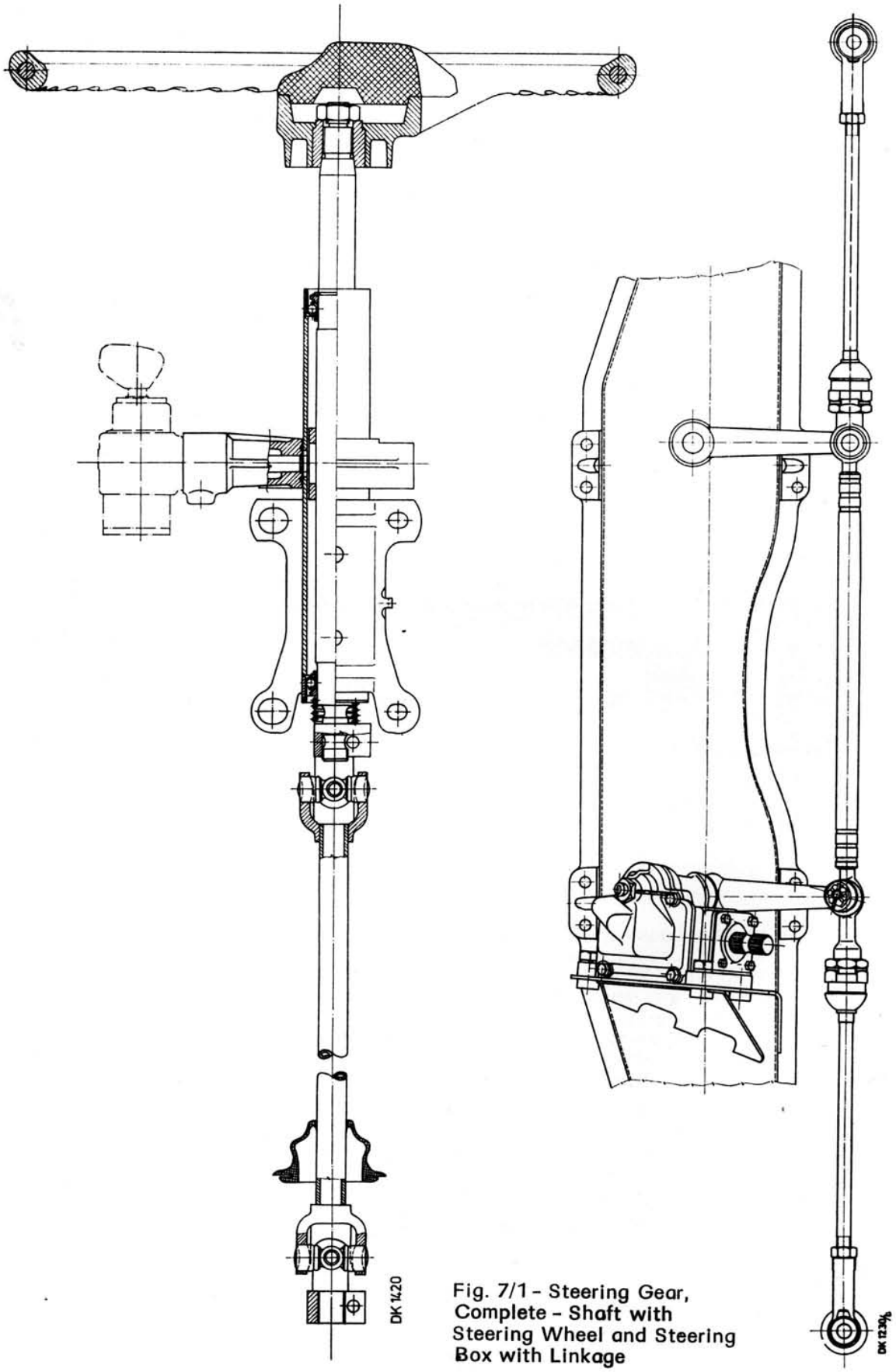


Fig. 7/1 - Steering Gear, Complete - Shaft with Steering Wheel and Steering Box with Linkage

Technical Description

The steering box with steering linkage and relay lever form an assembly unit with the front axle. The shaft is joined to the steering box by a shrunken splined connection.

The steering gear is symmetrical, with a screw and a nut. Self-lubricating ball-and-socket joints provide for the connection of the individual parts of the steering linkage. The relay lever is supported on self-lubricating bearings.

The crank-type steering wheel shaft is split and provided with cross-pin joints and a guide bearing with a permanent lubricant filling. The bearing houses the steering lock combined with the switch box.

The steering wheel is fitted on the shaft splines and secured with a nut.

7.1 REMOVING AND REFITTING STEERING BOX

Removal

1. Take out the spare wheel and detach the connection of the steering linkage with the steering drop arm – see Chapter 7.5.

2. Remove the nut of the bolt connecting the steering column shaft with the steering box and withdraw the bolt.

3. Remove bolts fastening the steering box to the front axle and lift away the steering box.

Depending on circumstances (the steering box cannot be disengaged from its connection with the steering column shaft due to lack of space), remove the steering wheel and the steering column shaft – see Chapter 7.8. Owing to the small distance by which the shaft can be shifted, it is not necessary to disconnect electric cables but they should be remembered and the shaft should be handled carefully. Fasten it provisionally in position after having detached it from the steering box.

Refitting

Reverse the removing procedure. Set the road wheels in the straight-ahead position and adjust the driving dog of the direction indicator self-cancelling switch (if it is part of the car equipment). Complete the refitting procedure by installing the steering wheel – see Chapter 7.7.

7.2 DISMANTLING STEERING BOX

1. Remove the screw plug from the hole in the lid (side screw plug) and drain the oil.

2. Fasten the steering box in a vice by clamping the relay lever, unlock and screw off the lever hold-down nut, and lift away the key.

3. Bolt down the steering box to a dummy bracket clamped in the vice (the bracket is to be made in advance individually – the steering box should not be clamped in the vice by its lugs). Slacken the nut and the set screw in the lid to preclude its distortion when releasing the flange bolts, remove the bolts and lift away the lid.

4. Remove the rocker shaft and steering nut (half-nut) from the steering box. Remove the bolts of both bearing caps and detach the steering box from the bracket.

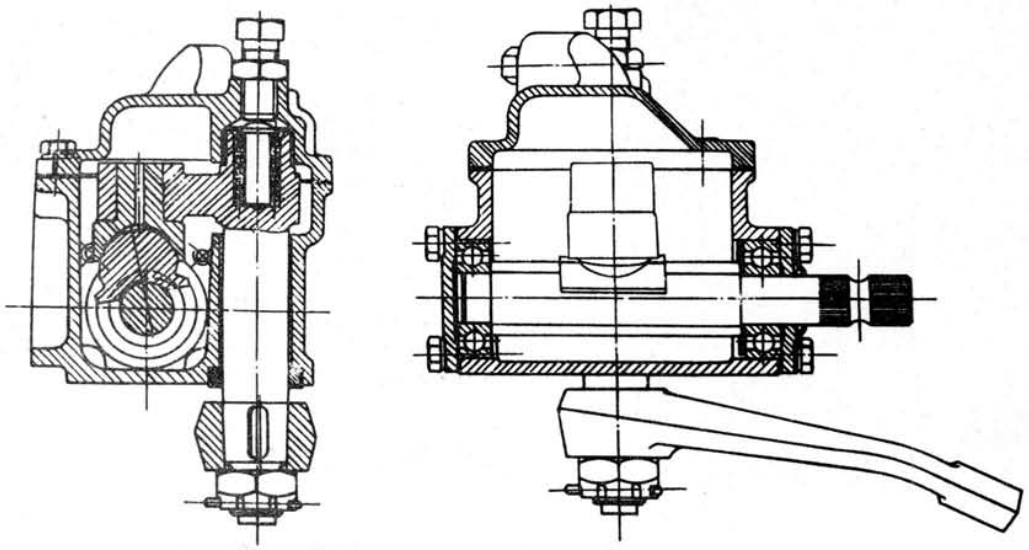


Fig. 7.2/1 – Steering Box – Sectional View

5. Place the steering box with its bottom ball bearing resting on the MP 7-102 jig and press the steering screw with both bearings into the jig. Extract the bottom bearing using the MP 6-111 king pin socket remover and push the steering screw with the top bearing out of the steering box. Support the bearing by the MP 7-102 jig and press it out.

7.3 REASSEMBLING STEERING BOX

1. Press the dust cup with its sealing ring into the steering box with the pressed-in bush after having thoroughly cleaned the box. Now place the box on the MP 7-102 jig and press-in the bottom ball bearing using the pressing mandrel MP 7-103.

2. Fit the lower bearing cap sealed off with a paper gasket and sealing compound, slip spring washers on to the bolts, and tighten the bolts with a torque as per Chapter 1.8. Fit the washer on the steering screw with its deflection facing the screw thread and press the top bearing on the screw using the MP 7-103 pressing mandrel.

3. Then place again the steering box on the MP 7-102 jig and press into it and into the bottom bearing the steering screw with the pressed-on top ball bearing, using again the MP 7-103 pressing mandrel. For further assembly, use the vice and the dummy bracket.

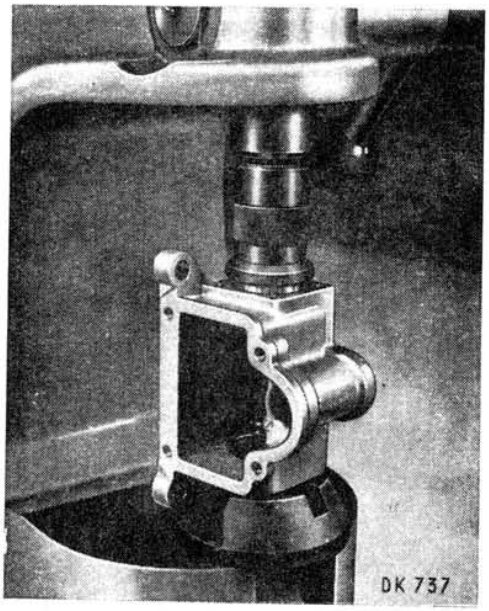


Fig. 7.3/1 - Pressing-in Bottom Bearing on MP 7-102 Jig (support plate) Using MP 7-103 Pressing Mandrel

4. Measure the height of the bearing protruding from the steering box and adjust it by fitting shims interspaced with paper gaskets coated with a sealing compound. Fasten down the cap by tightening the bolts. Check the steering screw for free rotation and the absence of play. The bearing should be without a clearance or there has to be a prestress of up to 0.07 mm.

5. Remove the bolts of the cap, slip the rubber sealing ring dipped in oil on to the shaft, and fit the dust cup on the cap. Install spring washers on the bolts. Should the cup be overstrained due to the tolerance of the recess for the sealing ring or the ring itself, install a paper gasket under it as under the cap.

6. Locate the steering nut on the screw followed by the rocker shaft with pin, spring, spring pin, and the lid gasket coated with a sealing compound, and fit the lid with bush in position to close the steering box. Install spring washers under the bolts and tighten the bolts with a torque as per Chapter 1.8. Screw the set screw into the lid and move the steering gear so that the drop arm is swivelled through about one half of its travel from the one or the other extreme lock position. With the drop arm in this position, screw down the set screw as far as it will go and then back it off through about 95 to 120°. This will provide for an adequate clearance of the steering gear. Lock the set screw in position with the respective nut.

7. Drive the key on to the rocker shaft cone, fit the drop arm and hold it down lightly with the nut. Clamp the drop arm in a vice, tighten fully the nut (for the tightening torque see Chapter 1.8), and secure the nut with a cotter pin.

8. Clamp again the steering box by means of the dummy bracket and make sure that the drop arm can swivel from one extreme lock position to the other. A certain resistance should always be present, but if the resistance is too great, decrease it by a slight slackening of the set screw in the lid. The rotating resistance of the shaft should not exceed 20 Nm (0.2 kpm). Refer to page 117/118 for testing procedure.

9. Set the assembled steering box in its fitting position (inclined by about 40°) and pour in oil through the hole in the box lid (cover) till the oil level reaches the bottom edge of the filling hole. Then screw down the tapered plug.

7.4 RELAY (IDLER) LEVER

For its installation (and removing in reverse order) and any pertinent particulars see the Chapter 6.5, paragraphs 2 and 3.

7.5 STEERING LINKAGE

Removal from and Refitting in Car

1. Take out the spare wheel.
2. Unlock and remove the nuts of ball pins and push the ball pins out of the linkage with the aid of the MP 6-138 remover. Before fitting the remover, on the steering drop arm ball pin, set the steering gear into the most suitable handling position.

Coat the jaws of the remover with oil so that they can slip easily under the rubber cups.

Note: The MP 6-138 remover is a shortened version of the MP 6-104 remover used for Škoda 1000 MB and 100/110 cars.

Reassembly and Adjustment

1. Clamp the track rod with pressed-on sockets in a vice. Install the ball pin socket into the hole of the longer track rod socket and screw a nut with a tab washer on to the thread.
2. Slip the socket liner and the track rod connector with the ball-and-socket joint dust boot on to the track rod.
3. Before their reassembly, lubricate the track rod ball, the track rod socket liner, and the ball pin socket with grease (Shell Retinax A, Mobilgrease MP or 933, Energrease L 2, Castrolease LM, or Agip F.1 Grease 30), packing with grease also the interior of the parts. Now screw them on to the socket of the track rod.
4. Screw down the nut and steering rod socket on the threaded end of the steering rod. The steering rod socket should be at a distance of 365 ± 1 mm between the ball pins.
5. The same procedure applies to the other end of the track rod. The distance of the steering rod socket between the ball pins should be, however, 339 ± 1 mm.

Tighten the track rod connector so that the effort (force) acting on the steering rod thread and required for deflecting the steering rod from its rest position is 2 kg 94.6 lbs. Then screw down the lock nut on the connector using a torque of 50 – 60 Nm and lock the nut with a tap washer.

7.6 BALL PINS AND DUST BOOTS

The ball pin with its socket is an undisassemblable unit. The ball-pin seats are lined with a self-lubricating material but a lubricant is required as a protection against corrosion (watertightness, etc.).

When replacing a socket with the ball pin, make sure, before refitting the new unit, that it is filled properly with a lubricant (for checking, remove the dust boot from the socket). Top up the lubricant if necessary, using exclusively the greases recommended in the previous chapter for the lubrication of ball joints when reasembling steering rods (Chapter 7.5, paragraph 3).

Attach the dust boots to the sockets with a lock ring installed so that its step is about perpendicular to the longitudinal centre line of the socket, i. e., so that it faces backward or forward.

The procedure is the same when replacing the dust boot (lubrication and fastening).

7.7 STEERING WHEEL

Removal

Remove two screws from the bottom part of the steering wheel spokes, lift away the spoke shroud and screw off the steering column shaft nut. Pull or jerk free the steering wheel.

Refitting

Fit the steering wheel on the shaft and turn it to place the wheels straight in the direction of travel. Check this position by rolling the car a certain distance, if necessary.

Remove the steering wheel and check and

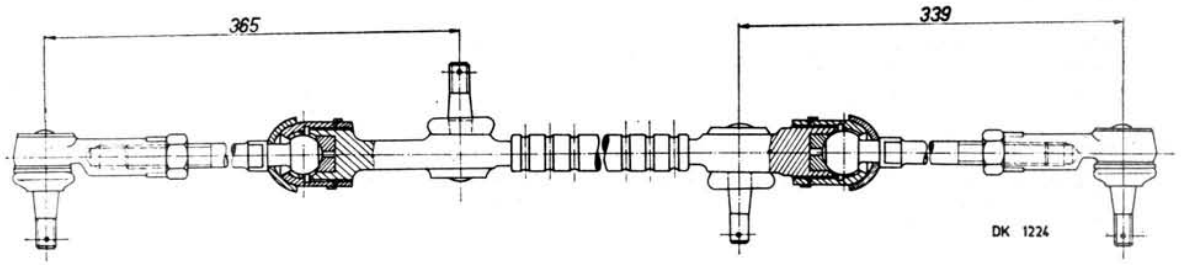


Fig. 7.5/1 - Assembly and Adjustment of Steering Linkage

adjust, if necessary, the driving dog of the direction indicator switch - see Chapter 13.17.

Refit the steering wheel so that its spokes are horizontal, lock it in position with the nut (for tightening torque, see Chapter 1.8), and bolt down the spoke shroud.

7.8 STEERING WHEEL SHAFT AND SHAFT BEARING

The steering wheel (column) shaft is built up of two parts with the bearing in the upper part. Usually, it is not necessary to disconnect the two parts of the shaft or to remove the bearing and steering lock. It can be removed from the car as a unit.

Removal

1. Remove the steering wheel - see Chapter 7.7.
2. Remove the screws on the lower part of the shaft cowling and pull the cowling off. After removing two bolts, detach the cluster switch on the shaft from the upper part of the shaft cowling.
3. Remove two front screws of the upper part of the cowling and remove the cowling.
4. Disconnect the leads from the switches and the switch box.
5. From under the car, remove the bolt of the coupling connecting the steering column shaft to the steering box and detach the dust boot from the floor. Remove the bolts of the shaft bearing (from under the shaft) and the bolts of the steering lock (from the front) fastening the shaft to the body, and pull out the shaft.

Refitting

To refit the steering column shaft in the car, reverse the removing procedure. While reinstalling the steering wheel (Chapter 7.7), do not forget to check the direction indicator switch for correct function.

Use plain and spring washers under the bolts of the steering lock bracket. Reinstall the shaft bearing using spacing tubes, rubber bushes, and plain washers, and secure the bolt of the coupling, connecting the steering column shaft with the steering box, with a self-locking nut (for tightening torque, see Chapter 1.8).

To Disconnect Shafts

Remove the bolt of the cross-pin joint connection.

Connecting of Shafts

Fit a fastening sleeve on the tube with the shaft, dip the ring in oil and slip it on to the shaft end with its wedge-shaped part toward the bearing, install the spring and the joint socket of the shaft bottom part. Tighten the connection with the bolt with self-locking nut (tightening torque as per Chapter 1.8).

The sleeve must be first built up if the shaft is refitted for the first time. Locate both halves of the sleeve on the tube and fasten them lightly together by bending the tab of one half of the sleeve over the other. The sleeve must on no account clamp the tube tightly.

Bottom Part of Steering Column Shaft

The shaft is provided with cross-pin joints and cannot be dismantled (taken apart). Before fitting the shaft dust boot, smear it with oil to facilitate its slipping over the parts of the joint. For this purpose, it is also advisable to wrap the joint in a plastic foil or to make a sleeve with a pilot cone.

Top Part of Steering Column Shaft - Bearing

Removal

1. Lift away the fastening sleeve and check whether the shaft rotates freely in the tube. If it is not the case, unlock the steering lock and press out the shaft proceeding from the side of its splined end.
2. If necessary, remove the circlip of the shaft and lift away the bearing. The other bearing has to be driven out by tapping it carefully through the cut-outs in the tube to avoid damaging it.
3. Remove the bracket with the steering lock - see Chapter 7.9.

Refitting

1. Slip the bearing packed with grease on to the upper part of the shaft, then the ring with its wedge-shaped part facing the bearing, and lock both parts in position with the circlip. Press the shaft into the tube and press-in the bearing (again packed with grease) from the other end.
2. Install the bracket with the steering lock - see Chapter 7.9.

Shaft Bearings

They have to be thoroughly lubricated first, since after their reassembly with the shaft additional lubrication is not possible. If there is any doubt concerning the grease packing, remove the circlip from the inner part of the bearing, take the bearing apart, clean it, and reassemble it after having packed it with the recommended grease, i. e., brand NH2 of Czechoslovak provenience or one of the brands specified in Chapter 7.5, paragraph 3.

7.9 STEERING LOCK

For access to the lock see Chapter 7.8 and Chapter 13, (Removing Steering Wheel Shaft, paragraphs 1 to 4, and direction indicator switch). Detach the steering lock bracket from the bodywork.

Removing Steering Lock from Shaft (Steering Column)

a) Unlock the steering lock, smear the shaft end with oil, and pull the bracket with the steering lock off the shaft while rocking it to and fro.
b) If the steering lock cannot be unlocked, remove the four bolts fastening the upper part of the shaft and the bolt connecting the cross-pin joint, and separate the upper and the lower parts of the shaft. Remove the lock as described in the following paragraph "Steering Lock".

Reinstalling Steering Lock on Shaft (Steering Column)

1. Smear with oil the rubber rings in the bracket and the end of the shaft tube, and move the bracket with the steering lock over the hole in the shaft tube by pushing and rocking. Check the lock for hitch-free operation.

2. If only the lock has been removed (as per paragraph b), reinstall it in the bracket, fasten it by slightly tightening the bolt, and test its operation. For full tightening of the bolt, see the next paragraph "Steering Lock".

3. Complete the reassembly of the removed parts and shaft components. For fastening of the lock see the next paragraph "Steering Lock".

Steering Lock

The steering lock consists of the lock body and the switch box. It is fastened to the bracket by a special bolt with a break-off head to preclude any forceful handling of the steering.

To remove the bolt it is necessary to drill a hole in it to the dimensions of the tool (peg of rectangular shape or a thread puller) available for bolt removal.

When reinstalling the steering lock in its bracket, tighten the bolt fully only after having ascertained that the entire steering gear is in perfect condition. Tighten the bolt till its head breaks off.

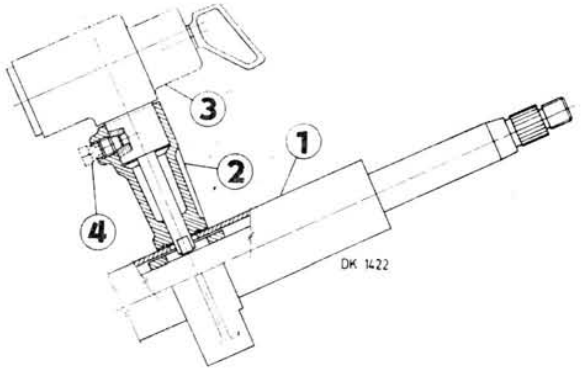


Fig. 7.9/1 - Fastening of Steering Lock in Bracket
1 - tube of steering column shaft, 2 - steering lock bracket, 3 - steering lock and switch box, 4 - steering lock fastening bolt

8 - SUSPENSION AND SHOCK ABSORBERS

Technical Description

The road springs are coiled of round-section wire. The shock absorbers are of the hydraulic and telescopic type.

8.1 FRONT SPRINGS

Classification of Springs and Their Use

With regard to their compressing force values (strength) and production tolerances, the road springs can be divided into two groups or classes (see the respective Table). Springs of the stronger class are marked as shown in Fig. 8.1/1.

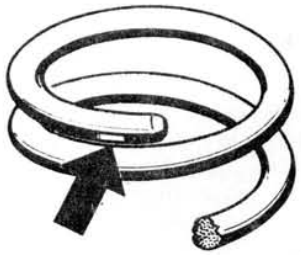


Fig. 8.1/1 - Identification of Stronger Springs by Means of a Ground Flat Area Near the Coil End

It is important to fit springs of the same class on a car. If the spring of one half-axle is defective, replace also the spring of the other half-axle. After a length of time, the road springs weaken due to fatigue of the material and replacement of one spring only is apt to result in uneven springing.

Year	1976-1978		1978 on	
Wire diameter	12.5 mm		12.5 mm	
Spring outer diameter	103		103	
Free length	284 ± 7 mm		276	
Force (effort) required for compressing the spring to a length of	+0 4070 −195 N	+195 4070 −0 N	+0 4070 −195 N	+195 4070 −0 N
	195 mm		185 mm	
Spring Marking	None	See Fig. 8.1/1	Yellow Spot	
			None	Fig. 8.1/1

For the removal and refitting of springs, see Chapters 6.4 and 6.5.

8.2 REAR SPRINGS

For the classification and use of springs, see Chapter 8.1.

Year UK	1977-78		78-79	79 on	
Wire diameter	13.6 mm		13.6 mm	13.6 mm	
Spring outer diameter	114.6		114.6	114.6	
Free length	331		310	316	
Force (effort) required for compressing the spring to a length of	+0 3950 −147 N	+147 3950 −0 N	+0 3950 −147	+0 3950 −147 N	−0 3950 +147 N
	234 mm		213	219	
Spring Marking	None	See Fig. 8.1/1	Yellow Mark	White Mark	
				None	Fig. 8.1/1

Spring Removing and Refitting

To remove and refit the spring, use the MP 5-110 jig (spring installer). Jack up the car and support the body so as to relieve the rear half-axle which drops on to the suspension yoke, remove the wheel (for more convenient handling), and the shock absorber.

Install the cross rails of the jig between the end coils of the spring or as near to them as possible, and screw the jig bolt into the cross rails from underneath. By turning the jig bolt, compress the spring to shorten it till it can be removed from the axle. This is also the procedure of refitting the spring. To prevent the displacing of the rubber pads during refitting of the spring, stick them on to the spring so that the end of the spring coil fits into the recesss in the pad.

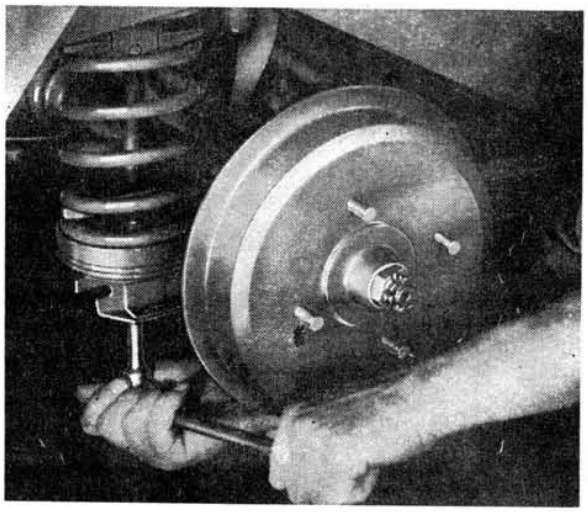


Fig. 8.2/1 - Removing Road Spring with the Aid of the MP 5-110 Jig (Spring Installer)

8.3 SHOCK ABSORBERS

The shock absorbers are of the hydraulic, telescopic, double-acting type of the PAL make. The damping effect depends on the speed of the relative movements of the axle and body. Data required for testing and adjusting the shock absorbers are given in the following Tables.

Front Shock Absorber - see Fig. 8.3/1
type PT 26×110, Ser. No. 443.621-215.000

	1977-78	1978 on
Maximum stroke	110 mm	110 mm
Damping force during down stroke (compression	470N	500N
Damping force during upward stroke (expansion)	108N	1300N
Filling capacity	100 cc	100 cc

Rear Shock Absorber
type T 26×175; Ser. No. 443.621-247.001

	1977-78	1978 on
Maximum stroke	175 mm	175 mm
Damping force during down stroke (compression)	470N	500N
Damping force during upward stroke (expansion)	950N	1200N
Filling capacity	160 cc	160 cc

*) At a temperature of 25 to 30 °C, a frequency of 100 strokes per minute, and a stroke of 100 mm.

Both types of shock absorbers are of similar design, only their bottom fastening is different (the front shock absorber has a fastening eye, the rear shock absorber has a bolt and lacks the outer protective tube). They have a different stroke, damping force, and filling capacity.

Removing and Refitting

When removing or refitting a shock absorber, retain the piston rod (upper fastening) by holding the flattened end of the thread in a spanner. In the case of the rear shock absorber, retain the piston rod in the bottom part by holding the head of the bolt connecting it to the shock absorber cylinder.

The assembly of the rubber bushes of the respective shock absorber mounting can be seen in Fig. 8.3/1.

Access to the upper mountings of the front shock absorbers is from the luggage boot (under the floor). The thread is protected by a cap nut. The mountings of the rear shock absorbers are accessible from the rear luggage compartment behing the rear seat backrests after folding away the upholstery on the wheel arch. The mounting is in the cylindrical extension piece in the scuttle of the rear dash.

Shock Absorber Dismantling

Dismantling is a routine procedure beginning with screwing out the plug (1) after the protective sleeve (tube) has been removed. Never dismantle the piston valves since there is a risk of impairing the damping force by mixing up the valves.

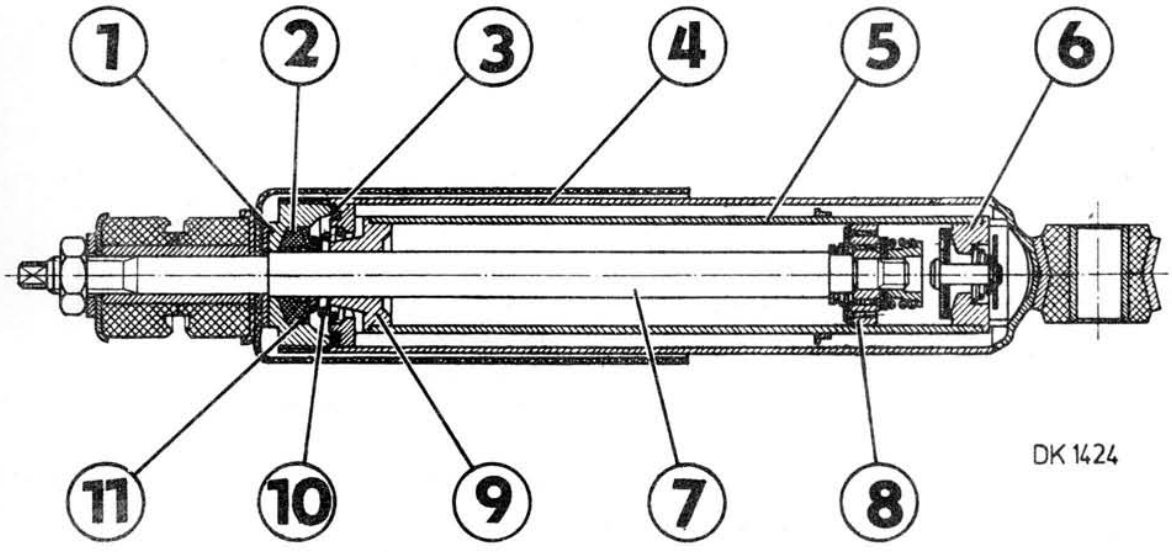


Fig. 8.3/1 - Front Shock Absorber - Sectional View

Shock Absorber Reassembly

On a reassembly, pay special attention to the cleanness of all inner component parts. Swill them in petrol or another cleaning agent.

1. Install the working cylinder (5) with the fitted suction valve (6) into the outer cylinder barrel (4). Fill it with the recommended exact amount of oil.

2. Now insert carefully the piston rod (7) with the fitted piston (8) and valves into the working cylinder. Slip the guide (9) on to the piston rod and tap it home lightly into the working cylinder. Fit the sealing ring (3) in to the groove of the guide, press it home, and locate the spring (10) with the retaining plate (11).

3. Force motor grease with an admixture of about 10% (weight) of molybdenum disulphide (MOLYKA grease) into the labyrinth seal. Install the pilot shaft (Fig. 8.3/2) on the piston rod and slip the prepared labyrinth seal with the inscription "Strana k oleji" ("This side to oil") facing downwards along the pilot shaft into the spring retaning plate.

4. Soak the sealing ring in the guide groove with damper oil, fit the plug and tighten it. Complete the reassembly by slipping on the protective sleeve (tube) of the front shock absorber and the respective fastening parts, i. e. plates and rubber bushes.

Shock Absorber Defects - Repairs

The most frequent defect is shock absorber leakage due to the damaged labyrinth seal of the piston rod or the damaged packing of the plug. In such a case, damper oil appears on the surface of the shock absorber. While replacing the labyrinth seal or the packing, top up oil to the recommended amount (pour the oil from the shock absorber into a graduated vessel and top up, as necessary).

If other defects occur, for example loss of damping force, which are not caused by a lack of oil in the shock absorber, have the shock absorber repaired in a specialized repair shop.

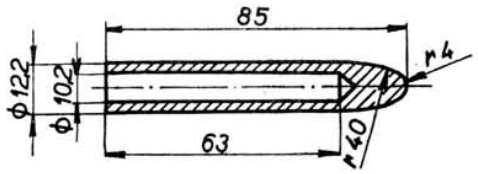


Fig. 8.3/2 - Pilot Shaft for Labyrinth Seal

Defect	Cause	Remedy
Inadequate damping force on rebound (expansion)	Foreign matter in oil - disc valve above piston not correctly seated	Remove foreign matter, flush shock absorber
	Valve above piston distorted	Renew valve
	Guide slack	Renew guide
	Clearance between piston and working cylinder exceeds considerably tolerance limits	Check clearance, replace worn parts with new ones
	Inadequate number of pop valves	Increase number or strength of pop valves
Inadequate damping force on compression	Foreign matter between pop valves of suction valve	Remove foreign matter, flush entire shock absorber
Excessive damping force on compression	Buckled disk valve of suction valve, too large seating face on suction valve body	Renew valve or valve body, reduce number of pop valves

Defect	Cause	Remedy
Jerky upward stroke	Airlock above piston	Fill shock absorber correctly with oil
	Oil leakage due to damaged piston rod	Renew piston rod and labyrinth seal - check shock absorber mounting on car
	Plug worked loose - oil leaks past the thread	Refill oil and tighten plug correctly
	Suction valve does not close, oil is forced into reserve tube - air is sucked in above the piston	Remove foreign matter from suction valve - renew suction valve body if valve seat is damaged
Damping force increases on compression	Excessive oil filling	Adjust to specifications
Shock absorber knocks when expansion starts. Damping force poor at first, later rises to normal	Valve above piston sticking	Remove cause of sticking, or chips - renew valve, refill shock absorber with oil

Check shock absorbers for correct operation direct in position in the car using a diagnostic apparatus or, after removal, on a test bench in complance with maintenance instructions.

9 - BRAKE SYSTEM

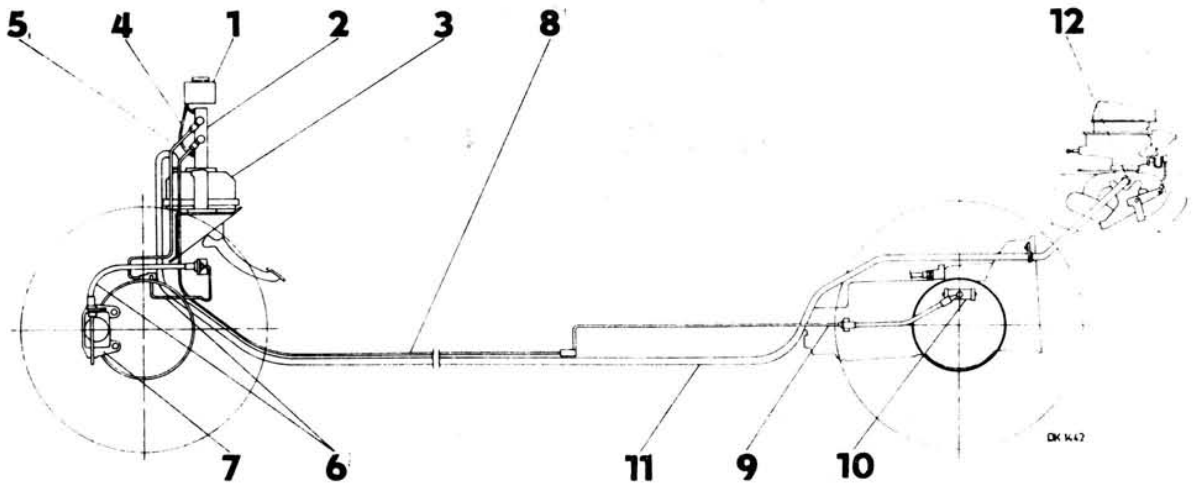


Fig. 9./1 - Hydraulic Brake System Diagram

1 - Brake fluid tank
2 - Master cylinder
3 - Brake booster (on ŠKODA 120 LS cars)
4 - Master cylinder supply line
5 - Main front-brake circuit line
6 - Front brake distribution system
7 - Front brake mechanism
8 - Main rear-brake circuit line
9 - Rear brake distribution system
10 - Rear brake mechanism
11 - Brake booster vacuum line } on cars fitted with brake booster
12 - Suction line connection

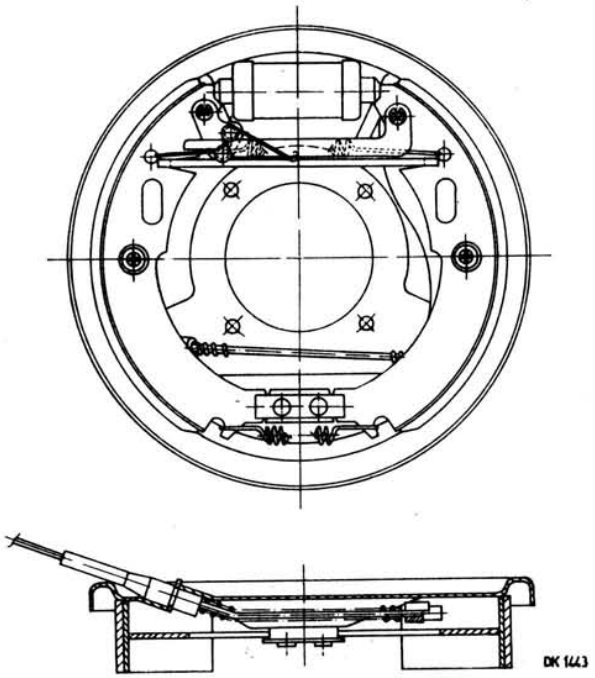


Fig. 9.1/1 - Rear Brake Assembly

Technical Description

The brake system is of the direct acting type. Disc brakes are provided on the front wheels, internal expanding shoe brakes with drums being fitted on the rear wheels. The shoes of both the front and rear brakes are adjusted automatically.

The hydraulic, twin-circuit service brake acts on all four wheels. Brake fluid is distributed from the master cylinder by steel pipes and rubber hoses.

The mechanical hand (parking) brake acts on the rear wheels. The braking effort is transmitted by a tie-rod and cables.

The brake system of ŠKODA 120 LS cars incorporates a brake booster.

9.1 REAR BRAKE ASSEMBLY

Dismantling

The brake assembly becomes accessible after removing the wheel hub - see Chapter 5.1. Dismantling procedures depend on the extent of the overhaul. Use the following procedure when removing brake shoes.

1. Fit the respective fixture on the wheel cylinder to prevent pistons from slipping out.
2. Depress the plates of the guide springs and rotate slightly the slot in the flattened part (land) of the pin to loosen the pinned connection. Disengage the hand brake cables from the rear brake-shoe lever.
3. Remove retaining rings from the shoes holding in position the force-off lever and swinging arm of the brake self-adjuster, disengage the spring from the lever arm, and lift away the parts from the brake shoes.
4. Prise the brake shoes loose from their abutments on the backing plate and the wheel cylinder.

Note: Refrain from using compressed air for blowing off dust from brake shoes and drums. The stirred-up dust, containing metal, asbestos, and resin particles, is harmful to health when aspirated. Therefore remove the dust with the aid of a hair brush.

Reassembly

1. Install the wheel cylinder on the brake backing plate.
2. Connect the brake shoes with the longer pull-off spring and insert a spacer between the rear shoe lever and the front shoe. Install the brake shoes into the wheel cylinders and swing them down into their abutments on the bottom of the backing plate.

Thread pins (nails) through the backing plate and brake shoes, install the springs, and lock them in position on the pins by fitting and slightly rotating the spring retaining plates.

3. Install the lower pull-off spring - see Fig. 9.1/3. Use the MP 6-110 needle or a screwdriver to stretch the spring.
4. Install the force-off lever between the pins of the swinging arm of the self-adjuster, locate the spring on the pins, and fit the prepared parts on the shoe anchor pins with the swinging arm forwards. Engage the spring with the lever arm and secure the parts on the pins with the retainer.

In this way, the brake mechanism can also be prepared as an assembly ready for installation when reassembling the axle.

5. Complete the reassembly with the axle installed in the car or removed from it by installing the wheel hubs with brake drums. For wheel hub reinstallation, see the Chapter 5.1. Above all, take care not to interchange the wheel hubs (paragraph 1). For the following procedures refer also to the paragraph 4 as well as to the paragraph 5 in Chapter 5.2.

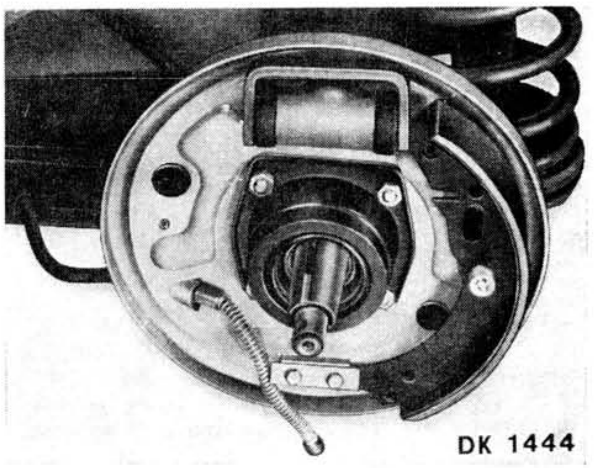


Fig. 9.1/2 - Holding down Wheel Cylinder Pistons with MP 6-109 Fixture

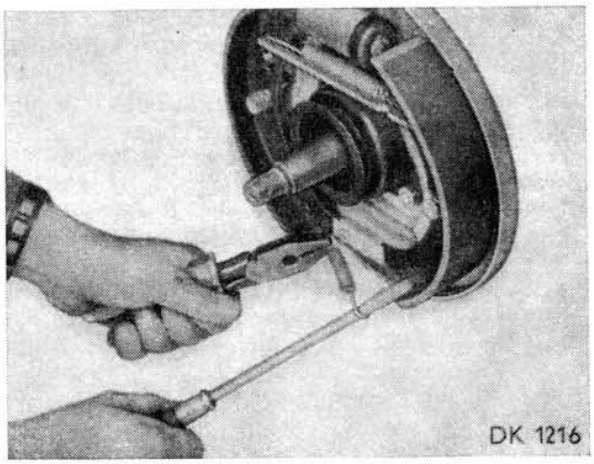


Fig. 9.1/3 - Stretching Brake Shoe Pull-off Springs

Brake Shoes and Brake Drums

When refitting a brake shoe with a partially worn lining make sure that it has a thickness sufficient to last till the periodic inspection (after every 20,000 kilometres). The new lining is 5 mm thick. When it is worn down to 1.5 to 1 mm (4 to 3.5 mm when measured with the shoe), the brake shoe has to be replaced with a new, or a reconditioned shoe with glued-on new lining. Be sure to replace the respective brake shoes in both wheels to preserve a uniform braking effect.

Special glues or cements and hardening at high temperatures are required when relining the brake shoes so that this job can be done in specialized repair shops only. For information, apply to the brake manufacturer - Autobrzdy Nat. Corp., Jablonec nad Nisou.

Brake drums are grey cast-iron castings. Their unequal wear can be rectified by machining to a 231 mm diameter. No tool marks must be left on their surface which has to be perfectly smooth. The alignment deviation and machining tolerance should not exceed 0.1 mm. The maximum permissible wear is up to 232 mm in diameter.

Only brake drums with an identical diameter are permitted to be mounted on one and the same axle.

9.2 FRONT BRAKE ASSEMBLY

Dismantling and Reassembly

1. Detach the brake fluid supply piping from the brake. Absolute cleanliness is a must. Otherwise dirt and foreign matter will penetrate into the piping.
2. Remove bolts holding down the brake yoke and lift away the brake assembly.
3. Use the MP 6-132 gauge to set correctly the brake (new or repaired) on reinstallation.
4. Select the shims required to fill the gap between the end of the gauge and the face of the fastening lug. To position correctly the brake, insert shims between the fastening lugs and yokes. You can, however, measure direct the distance between the fastening lug and the brake disk and set this distance in compliance with Fig. 9.2/1 by adding packing pieces to the shim pack.
5. Using the respective capscrews and spring washers, bolt down the yoke to the lugs.
6. Attach the supply hoses and bleed the brake.

Replacing the Brake Disk

A worn brake disk can be reconditioned by grinding it to a thickness of 7.5 mm. If necessary, replace it with a new one 9 mm thick.

The lowest limit of thickness of a still usable brake disk is 6.5 mm. The maximum permissible run-out of the friction surface is 0.15 mm.

1. After having lifted away the brake assembly, remove the wheel hub and then the brake disk.
2. Reassemble the brake disk with the wheel hub using capscrews with spring washers.
3. Top up or change the lubricant in the wheel hub bearings and reinstall the brake assembly.

Replacing Brake Pads

The overall thickness of a brake pad with new lining is 15 mm. When worn down to 7 mm (with the lining 1.5 mm thick), the pad is unusable.

Always replace brake pads on both ends of the axle at the same time so that their wear is uniform. With regard to the coefficient of friction, they have to be of the same type and make.

1. Suck off the hydraulic fluid from the tank so that it is only half filled.
2. Remove cotter pins and lift away the brake lining cover.
3. Remove the friction pad, clean thoroughly the cavities of the yokes, piston parts, and dust boots.
4. Fit the MP 6-134 force-off lever over the brake disc and drive the pistons into the cylinder bottoms by the pressure of levers.
5. Place a new friction pad into the brake assembly making sure that the clamp of the thrust plate fits into the collar of the piston face.

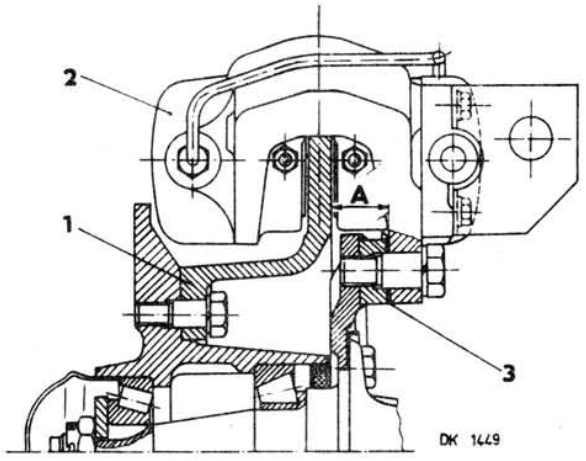


Fig. 9.2/1 - Front Wheel Brake Mechanism and Mounting (setting) Dimensions

1 - Brake disk
2 - Brake
3 - Shims
A - Brake setting dimension - 18.7 ± 0.2

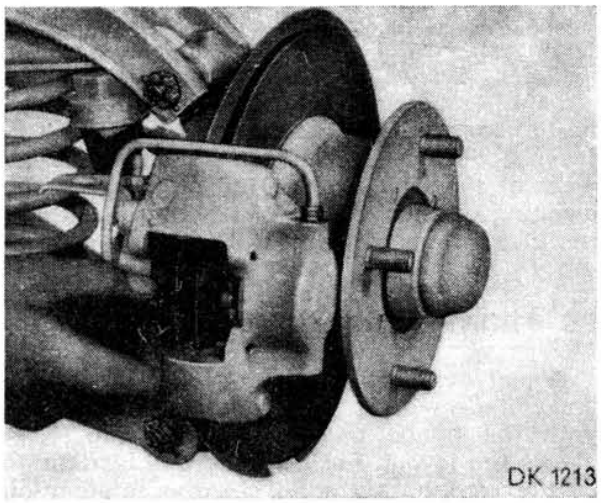


Fig. 9.2/2 - Removal of Brake Friction Pad

6. Replace the disk brake cover and top up the brake fluid in the tank.

7. Depress fully the brake pedal several times to make the pistons set in the new position according to the replaced brake pads.

9.3 MASTER CYLINDER

The master cylinder is of the tandem type in which the so-called floating piston divides the cylinder into two service circuits. A valve is provided in the outlet socket for the rear circuit, retaining a residual pressure in the piping within a range of 0.059 to 0.157 megapascal (0.6 to 1.6 kg/cm²). With the cylinder assembled with the pedals and/or the brake booster, the pedal press button must have a certain end play so that the main piston of the cylinder is fully relieved in its rest position - see Chapters 9.6 and 12.1. The end play should be adjusted whenever replacing the master cylinder.

The bore of the standard cylinder is 19 mm, and 22 mm of the cylinder operating in conjunction with the brake booster. From the point of view of functional arrangement, both cylinders are identical while their technical design is adapted to working dimensions. The assembly of the 19 mm bore cylinder has an additional shut-off dust boot.

Removal of Master Cylinder from Pedal Bracket and its Reinstallation

To gain access to the master cylinder remove the cover in the luggage boot by prising out the side and bottom fastening pins of the cover. Drive in the pins when reinstalling the cover.

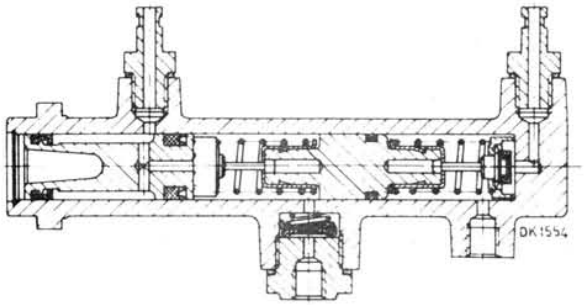


Fig. 9.3/1 - Sectional View of Brake Master Cylinder

The master cylinder is held down by nuts with spring washers. When removing the master cylinder from the brake booster (on ŠKODA 120 LS), protect the rubber seal of the brake booster press button from contamination with the brake fluid - see Chapter 9.6.

For clearance between the piston and press button, see the introductory paragraph of this chapter (9.3) and Chapter 9.6.

Chapter 9.7 deals with the connecting line between the master cylinder and the hydraulic fluid tank.

Cleaning and Lubrication of Parts and Reassembly

Use only alcohol (denaturated) for cleaning the working parts of the hydraulic system and only the brake fluid for their lubrication.

Master Cylinder Dismantling and Reassembly

Remove the ring from the front of the cylinder to gain access to its interior parts which can then be lifted away or blown out of the cylinder with compressed air. Slip off the pistons from the assembly of the floating piston, and remove the piston cups after raising the piston cup tabs. The cylinder layout is shown in Fig. 9.3/1 and/or the catalogue of spare parts.

When replacing the parts, coat them with the brake fluid. Absolute cleanliness is a must.

To reinstall the secondary cup of the main piston (Fig. 9.3/1 - the first cup on the left), use the fixture (mounting bush) in the manner shown in Fig. 9.3/2. Press the new cup on to the piston and slip its retaining ring on to the narrowed-down part of the piston.

Place both halves of the guide bush on the piston with the flange facing the cup, and slip the clamping ring over them.

Drive the cup retaining ring into the guide bush. Advance the fixture toward the cup and push the cup into it using a blunt tool without any edges. Now remove the fixture and press down the retaining ring to the end of the cup.

Reassemble the pressure-relief valve in the following order: dust cup, spring, spring plate, and seal.

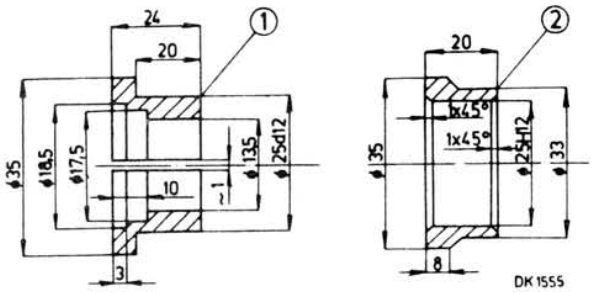


Fig. 9.3/2 - Secondary Piston Cup Mounting Fixture for dia. 12 mm Master Cylinder (1 - guide bush, 2 - clamping ring)

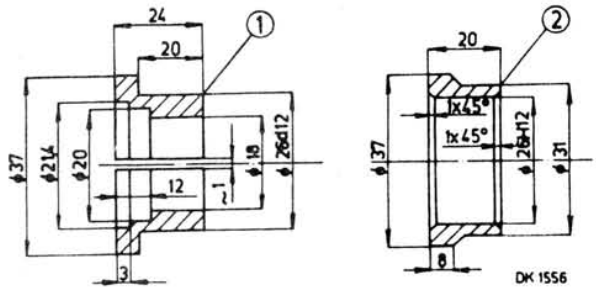


Fig. 9.3/3 - Secondary Piston Cup Mounting Fixture for dia. 22 mm Master Cylinder (1 - guide bush, 2 - clamping ring)

9.4 REAR BRAKE WHEEL CYLINDER

The wheel cylinder requires practically no servicing. Whenever removing the brake drums, examine the rubber dust boots. They have to be perfectly tight, flexible, and undamaged. When replacing them, examine the inner surface of the wheel cylinder and the surface of the piston.

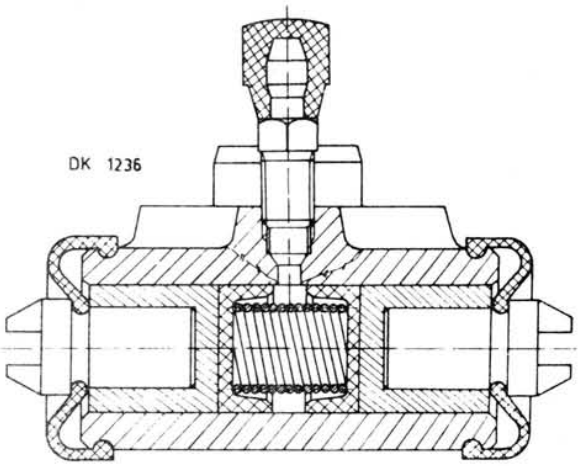


Fig. 9.4/1 - Sectional View of Wheel Cylinder

Nicks and burrs are apt to damage the dust boot and prevent its perfect adhesion to the cylinder. Every boot must be adequately pre-stressed (tapered) so that its sealing edge can be in permanent contact with the cylinder surface. A decreased prestress signals excessive wear of the dust boot or its fatigue. For the cleaning and lubrication of working parts, see the instructions in Chapter 9.3.

9.5 FRONT BRAKE WHEEL CYLINDERS

Wheel cylinders are assemblies formed by one cylinder with the yoke and another cylinder with the flange and accessories. Fig. 9.5/1 shows the layout. For cleaning and lubrication of the working surfaces, see the information in Chapter 9.3.

Dismantling

1. After having removed the brake pads, disconnect and lift away the interconnecting piping, and then remove four capscrews to separate the cylinder with the yoke from the flanged cylinder.

2. Pull off the retaining ring of the dust boot and lift away the dust boot. Connect a compressed air supply (or the brake master cylinder) and use it to force the piston out of the

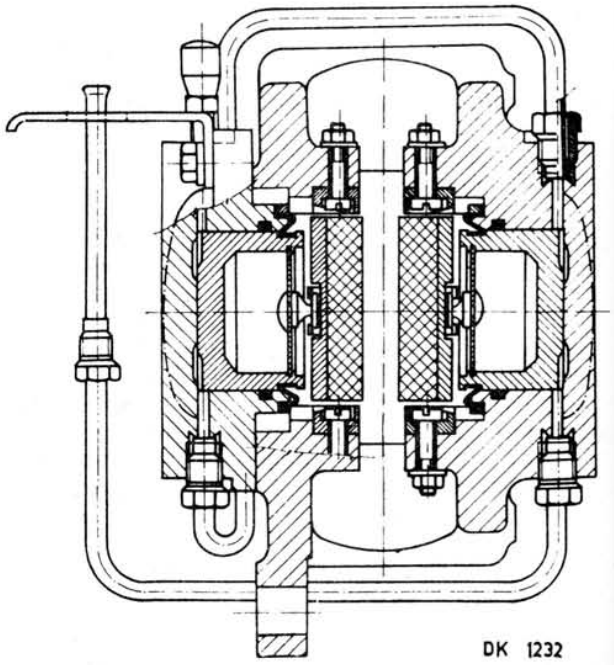


Fig. 9.5/1 - Front Brake Wheel Cylinder c/w Brake Pads

cylinder. Catch the thrown out piston into a clean rag to prevent its being damaged.

3. Now, if necessary, remove the sealing ring and the bleeder screw from the cylinder. Do not remove the abutments forming the guides of brake pads. In the first place, it is not necessary and, in the second place, you would disturb their factory-set position.

Reassembly

1. Use a hone to remove nicks from the cylinder and piston surfaces as well as burrs on the inner edges of the sealing ring, should a new one be used.

2. Coat the working surfaces of the cylinder and piston with brake fluid, dip the sealing ring into the brake fluid, and place it into the cylinder. Then press carefully the piston into the cylinder.

3. Locate the dust boot on the piston and fasten it to the cylinder by means of the respective lock ring using the press plate - for details see Chapter 15.8.

4. Bolt the flanged cylinder to the cylinder with the yoke using capscrews and spring washers. Insert the brake hose retainer under the washers in the part next to the bleeder screw. A left-hand and right-hand unit will be formed by installing the bleeder screw (always on top).

5. Screw down the bleeder screw with a protective cap and connect the interconnecting piping - tighten the unions sensitively so as not to damage the tapered (conical) surfaces of the pipes. Connect one pipe from below under the bleeder screw and route it upwards into the other cylinder. The other pipe should be connected so that its end comes in the middle of the brake hose retainer.

6. Now, depending on the extent of dismantling, refit the brake pads and reinstall the brake cover.

9.6 BRAKE BOOSTER

The brake system of ŠKODA 120 LS cars incorporates a brake booster, the boosting effect of which is derived from the underpressure (vacuum) generated in the engine intake mani-

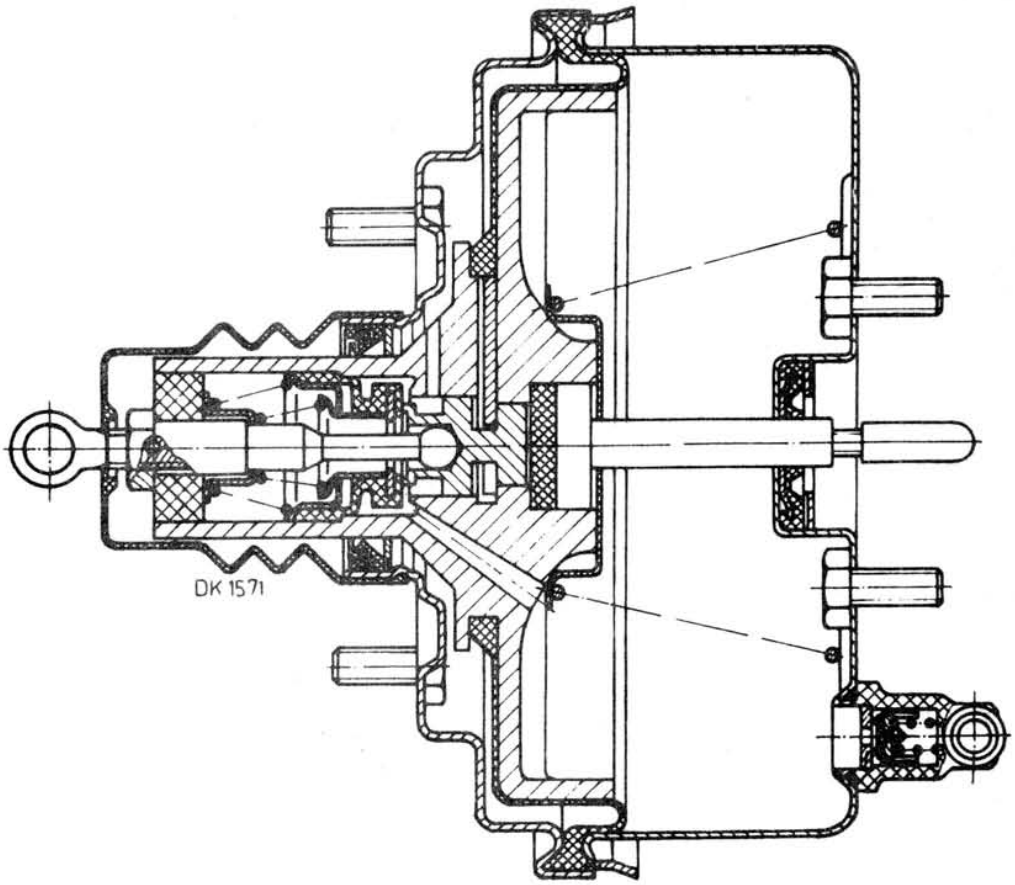


Fig. 9.6/1 - Sectional View of Brake Booster

fold at the moment of the application of the brakes, and led through a rubber hose (tube) to the booster.

Removal and Refitting

The brake booster is held down on the pedal bracket by nuts and spring washers. The lug of the control valve press button connects it with the brake pedal, on which it is secured by a retaining ring. These mounting parts or the connections of the vacuum supply are to be handled only when removing or refitting the brake booster.

However, we advise you to have this job done in a specialized repair shop properly instructed by the brake manufacturer. All rubber parts (in the terms of current maintenance, this is practically the seal of the press button controlling the master cylinder) must be protected from the effects of the brake fluid or other lubricants. Use petrol for cleaning the rubber parts.

Adjustment

1. Adjust the clearance between the brake booster press button and the cylinder piston whenever the master cylinder or the brake booster are replaced, or whenever there is any doubt concerning the correctness of the assembly of the master cylinder with the brake booster. Measure the distance between the cylinder bottom recess and the cylinder flange mating surface as well as the length of the press button protruding over the mating surface of the booster. Compare the measurings and adjust the length of the press button by rotating its threaded end to obtain a clearance of 0.5 to 1 mm between the press button and the piston.

Still better, you can use special tools MP6. 141A. Fit it on the master cylinder, push its spindle into the cylinder till its rounded end rests against the piston, and lock it in this position with the respective retaining screw. Apply the fixture to the booster and rotate the booster press button so that it just touches the lower flat part of the fixture spindle.

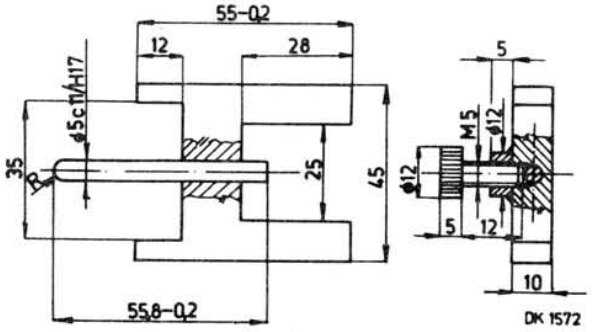


Fig. 9.6/2 - Brake Booster Press Button Adjusting Fixture

MP6 141A

2. If it is necessary to level the brake pedal with the clutch pedal, adjust the length of the control valve press button lug.

Remove the brake booster from the pedal bracket, slip off the collar (cup), connect the booster with the pedal, and refit it temporarily to the bracket. Now rotate the hexagon on the threads of the lug till both the clutch and brake pedal are level. Remove once more the booster from the pedal and pedal bracket, reinstall the collar (cup), and complete the final reassembly.

9.7 BRAKE FLUID TANK, PIPING AND HOSES

Tank and Filling Hose

The brake fluid tank is held in position in its bracket by a slip-over clamp. Special rubber hoses connect it with the brake and clutch master cylinders. Hose clips are used to secure the hoses on the tank outlet sockets. Both the side and centre outlet of the tank are connected to the brake master cylinder, the third outlet being connected to the clutch master cylinder (see Fig. 12.1/1).

Pressure Piping and Hoses

The **rigid part** of the hydraulic line consists of special steel pipes. Their connections with other parts of the line are sealed off by clamping on the conical surfaces.

If these conical surfaces become damaged, remove them and form new ones by flaring the pipes. To do this, use the caulking holder, type MP 9-151. Clamp the pipe in the holder so that it is level with its upper edge and flare the pipe with a caulking chisel. The holder is designed to be clamped in a vice.

The holder has two drilled holes of 5 and 6 mm in diameter so that it can be used also for repairs of pipes of the clutch line. For dia. 5 mm holes, use the MP 9-152 and for dia. 6 mm holes, the MP 9-153 caulking chisel.

The **flexible part** of the hydraulic line consists of special hoses. When fitting them to the rear wheel cylinders, turn them in a position which will prevent their contact with any parts of the car in both extreme positions of the car suspension. This is why the nipples at the rear wheels are inclined downward through an angle of 30 degrees from the horizontal plane.

9.8 HAND BRAKE

The hand-brake lever between the front seats controls the tie-rod which actuates the rocker (see Fig. 9.8/1). Cables connected to the rocker

pull the levers on the front brake shoes and expand the shoes over the bar.

Hand Brake Adjustment

The travel of the hand-brake lever increases gradually due to wear of the brake lining and stretching of cables. If the travel is excessive and the brake efficiency decreases, adjust the brake shoes and shorten the brake cables in the point under the lid of the floor tunnel in front of the rear seats. Prise off the lid to gain access to the cables.

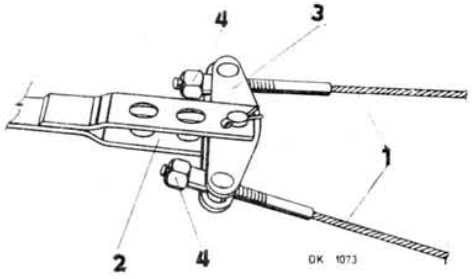


Fig. 9.8/1 - Rocker with Tie-rod and Brake Cables
1 - brake cables, 2 - brake lever tie-rod, 3 - rocker, 4 - adjusting nut

The length of the cables can be changed by rotating the adjusting nuts on the rocker. Adjust the cable lengths so that the rocker is practically perpendicular to the brake tie-rod when the brake is applied. If this adjustment is of no avail, reset the connection of the tie-rod and rocker.

To be certain that the cables will be completely slack after releasing the brake, push the lever first fully down and then pull it upward till you hear the clicking home of one or two teeth of the lever pawl, and only now adjust the length of the cables keeping the hand-brake lever in this position.

To Remove and Refit Brake Cables

(To refit the cables, reverse the order of their removing procedure)

Detach the cable from the rocker by screwing off the adjusting nut - see Fig. 9.8/1. Then disconnect the cable holder from the rear half-axle radius arm.

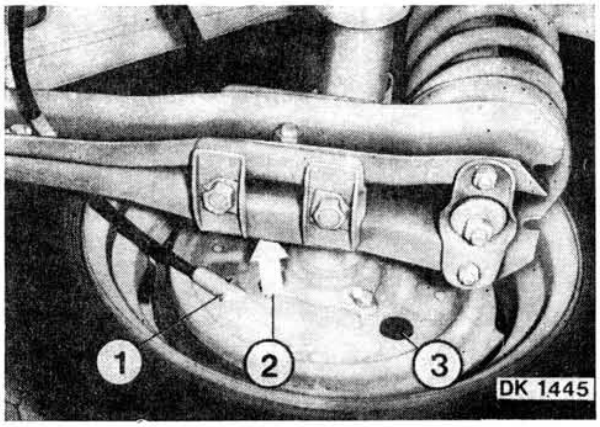


Fig. 9.8/2 - Backing Plate of Right-hand Rear Wheel Brake
1 - plug, 2 - lock ring

Remove the rubber plug stopping the auxiliary mounting hole in the brake backing plate. Proceeding through this hole, disengage the cable from the relay lever of the brake mechanism. Remove the retaining ring of the cable nipple holding down the rear end of the bowden tube and pull out the brake cable.

Hand-brake Lever

If it is necessary to repair the hand-brake lever, its pawl, etc., disengage the lever tie-rod from the rocker. Remove two capscrews holding down the lever, pull out the lever, and release the circlip to detach the lever from its bracket.

9.9 BRAKE FLUID AND BLEEDING OF BRAKES

For detailed information concerning the brake fluid (brand), the filling of the tank, the change of the brake fluid, and bleeding of the brakes, see Chapters 15.2 and 15.8.

After having handled the brake fluid, wash your hands with soap. Before handling the brake fluid, it is recommended to apply a special ointment on the hands to prevent rashes. Swallowing of the brake fluid which has got on food from unwashed hands can result in gastric trouble.

10 - WHEELS AND TYRES

Technical Description UK ONLY

Year	Wheel Size	Tyre Size	Tube/ Tubeless	Tyre Pressure	Front/ Rear
(A) 1977-1978	4½J x 14 steel	155 x 14	Tube	KPa26/30	PSI
1978 on	4½J x 13 steel	165 x 13	Tubeless	KPa20/26	PSI
	5½J x 13 steel	165 x 13	Tubeless	KPa20/26	PSI
	4½J x 13 steel	165 x 13	Tube	KPa20/26	PSI
	5 J x 13 alloy	165 x 13	Tubeless	KPa20/26	PSI
	5½J x 13 alloy	165 x 13	Tubeless	KPa20/26	PSI

except (A) above increase tyre pressure by 20 to 30 KPa for heavy loads and extended motorway use.

Tyre Pressures (cold)

Chemlon cross-ply tyres and radial-ply tyres:

front . . . . . 150 kPa (1.4 kg/cm²)
rear . . . . . 190 kPa (1.9 kg/cm²)

Heating up of the tyre during travelling causes the pressure to rise, but decisive are the inflation pressures of cold tyres, tubed or tubeless. To reduce tyre wear when driving on motorways, tyre pressures can be raised by additional 20 to 30 kPa (0.2 to 0.3 kg/cm²).

10.2 CHANGE AND INTERCHANGE OF TYRES

Tyre change

If it is not possible to use the same type of tyres on all the wheels, one condition must be observed, namely that on one axle there will be always one type of tyres. When using two radial tyres, their place is on the rear axle.

Other rules concerning, for example, a uniform type of tread, the minimum height of the tread pattern (figures), etc., should be adhered to in compliance with the locally applicable recommendations and standards.

Interchange of Wheels

If the tyre wear is unequal, it is advisable to interchange the wheels, although this is not strictly a maintenance job. Interchange the wheels according to the diagram shown in Fig. 10.2/1, but only if a single type of tyres is used on the car.

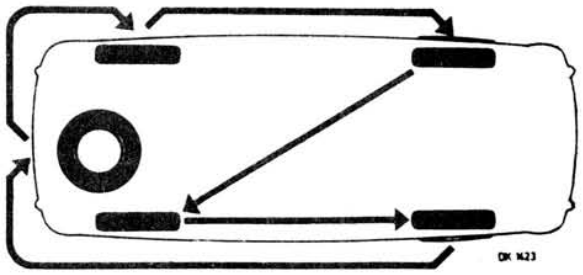


Fig. 10.2/1 - Interchange of Wheels

When combining two types of tyres on a car, the wheels should not be interchanged but only repositioned from the one side to the other and vice versa, if tyre wear is greater on one side.

Only use tyres of the same type on one axle. Use radial tyres only. If replacing a wheel ensure it is a match to the remainder of the set.

10.3 WHEEL BALANCING

For good steering properties of the car, the wheels with fitted-on tyres must be balanced as perfectly as possible. Unbalanced wheels tend to wobble, cause vibration and steering wheel tremor, and thus impair precise steering. In addition, rapid rotation of unbalanced masses of the wheels gives rise to secondary centrifugal forces stressing highly the axle and steering gear component parts and causing their premature wear. Wheel balancing is a must whenever a repaired or new tyre has been fitted.

The wheel complete with the tyre should be dynamically balanced by means of balancing weights fitted to the rim edge.

The permissible out-of-balance must not exceed 50 grammes on the rim radius. Every new tyre is provided with a coloured dot on its side, indicating its lightest point. Fit the tyre always with this dot facing the tube valve. In this position, the valve acts as an additional weight compensating the wheel overall unbalance to a considerable extent.

If dynamic balancing of the wheel is not possible, balance the wheel statically with the greatest possible accuracy. Balancing weights of 30, 50, 75, and 100 grammes are available.

10.4 TUBED TYRES

For mounting, dismounting, and repairs of conventional tyres with inner tubes (for particulars, see the preceding Chapters), the usual procedures are applicable. The permissible run-out (untrue running) of the rim is the same as for tubeless tyres (Chapter 10.5).

10.5 TUBELESS TYRES

The air-tight sealing of these tyres requires more care and a different handling than that of the tyres with inner tubes.

Preparation of Rim

Before mounting the tyre, inspect the rim for any technical defects. The points to be checked are the rim shoulder and the mating face for the tyre beads, in addition to the overall condition of the rim. If any defects are found, the rim must be reconditioned. A satisfactory rim must comply with the following conditions:

a) The rim shoulder and the tyre valve hole must not be distorted; there must be no sharp edges or protrusions likely to damage the tyre bead. Minor unevennesses can be hammered flat and smoothed with a file. The maximum eccentric running of the rim side must not exceed 1.5 mm.
b) The mating surfaces must be absolutely clean (free from stuck-on rubber, rust, etc.). Clean them with emery paper or a wire brush and coat them with paint.

Installing of Tyre Valve

Clean the rim with a dry rag. Push the rubber valve into the hole in the rim or pull it in by its thread using, for example, a lever as illustrated in Fig. 10.5/1.

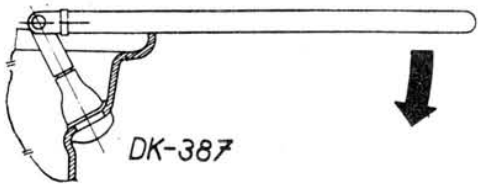


Fig. 10.5/1 - Pulling Tyre Valve into Wheel Rim

Mounting the Tyre

For mounting the tyre, use special machines and procedures, depending on the type of the machine. If such a machine is not available, install the tyre using special tyre levers. Ensure that the balancing dot is next to the valve. Tyre levers for fitting tubeless tyres differ in shape from conventional levers. They are thinner, without edges, and polished. Use them carefully in order not to damage the bead sealing rubber base. Insert the levers under the bead at short distances and refrain from using force. To facilitate sliding of the tyre casing beads over the rim shoulder, moisten them with water and tap them with a rubber mallet when easing them over the rim shoulder. Inflate the mounted tyre immediately. Check the tyre for proper bedding in the rim and square seating on it. Holding the wheel perpendicularly, strike it several times against the floor at several points to force the tyre beads to bed correctly on the bead seats.

Inflation

Remove the valve core to increase the diameter of the hole for air inlet (air should be injected in quick shots to force the beads on to the bead seats) and inflate the tyre. Use a compressor with air receiver, the compressed-air line of the workshop, or compressed-air cylinders. The relief valves have to be adjusted to a pressure of 350 kPa (3.5 kg/cm²).

Never allow the inflation pressure to rise unnecessarily. As soon as the tyre has snapped into position on the rim and is free from leaks, adjust the pressure to 250 - 350 kPa (2.5 - 3.5 kg/cm²). If the tyre refuses to bed properly on the rim, for example due to distorted beads or beads compressed due to incorrect storage, press the tyre circumference inward to open wide the beads which will then bed properly on the rim. Use either a length of rope or a special tightener. Slip the rope over the tyre circumference with a certain clearance, insert a stick between the tyre and the rope, and twist the rope.

Adjust the tyre pressure to specifications and submerge the wheel in water to check the tyre for air leaks.

Steps to Be Taken in Case of Leakage

If air leaks past the valve, pull the valve slightly outwards. If air leaks from under the bead seats, deflate the tyre, push the beads clear off the rim shoulder, and slightly turn the tyre (take care not to disturb the balancing).

If air leaks through the rim, seal the rim with rubber cement or by a new weld.

Tyre Balancing

The current balancing practice is to insert the weight bracket between the rim shoulder and the tyre bead.

Tyre Dismounting

To dismount a tubeless tyre, proceed in the same manner as with a tubed tyre, either using a machine or tyre levers. In the latter case, be sure to use again the special tyre levers, i. e., for tubeless tyres.

In any case, proceed with the utmost care to preclude damage to the sealing beads.

Tyre Repairs

The defect most likely to occur is a puncturing of the tyre tread with a nail. A tubeless tyre will not deflate or just to a negligible extent as long as the nail remains in the puncture. Even after it has been removed, the air leaks very slowly. Mark the punctured point. A hole caused by a small nail can be repaired with a rubber compound, larger holes by pressing-in a rubber rivet. For this purpose, use the special repair kit for tubeless tyres available on the market.

Punctures of a more serious nature, for instance caused by stones, must be repaired in a tyre repair shop by vulcanizing.

If the defect is of such a nature that the tyre cannot be repaired, fit it with an inner tube and use it as a tubed tyre.

10.6 SNOW CHAINS

Chose the type with only peripheral straps and clamps provided on the outer tyre sidewall so that connecting links on the inner sidewall do not obstruct the wheel lock movement.

Alloy Wheels

If the wheel finish is damaged immediate steps should be taken to ascertain the extent of the corrosion. Light damage should be cleaned back and sealed with paint after the application of a suitable finish.

11 - COOLING SYSTEM AND HEATER

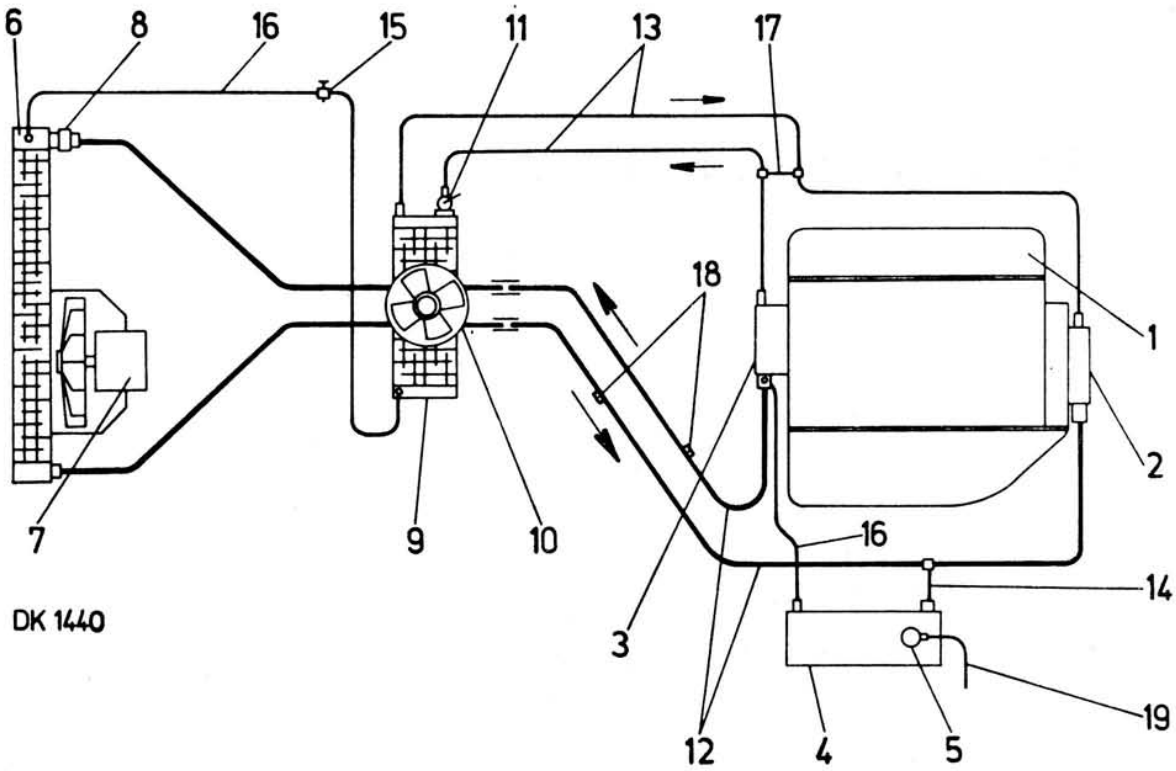


Fig. 11/1 - Cooling and Heating System Diagram

1 - Engine, 2 - Coolant pump, 3 - Thermostat, 4 - Coolant tank, 5 - Screw cap, 6 - Raidator, 7 - Radiator fan, 8 - Fan thermoswitch, 9 - Heater, 10 - Heater fan, 11 - Heater regulating valve, 12 - Water line to radiator, 13 - Water line to heater, 14 - Filling line, 15 - Bleed valve, 16 - Bleed pipe, 17 - By-pass pipe, 18 - Drain screws, 19 - Drain hose

Technical Description

The engine cooling system is of the enclosed, overpressure, force-feed type incorporating a coolant pump and a separate coolant tank (coolant level equalizing tank), and operating in combination with the car heating system. Its diagram is shown in Fig. 11/1. The engine oil cooling system is separate - see Fig. 11.9/1.

All the year round, the engine is cooled with an antifreeze cooled in the radiator by the head-on air blast and by the radiator fan controlled by a thermoswitch.

The temperature control includes a thermostat mounted on the engine, which cuts off the radiator at a low temperature of the engine (coolant), and a thermoswitch provided in the radiator to switch on the fan if the head-on air blast fails to cool down the coolant to the specified temperature.

The heater is actually of the hot-water type, the car being heated by the engine coolant. Air to the heater is supplied by the heater fan controlled by the driver.

Oil in ŠKODA 105 S engines is cooled by heat dissipation from the sheet oil sump surface, in ŠKODA 120 L engines by heat dissipation from the ribbed cast oil sump, and finally, in ŠKODA 120 LS engines, both by heat dissipation from the surface of the ribbed cast oil sump and by the oil cooler. For oil cooler connection, see Chapter 11.9.

For cooling in subtropical and tropical regions refer to Chapters 16.1 and 16.2.

11.1 COOLING SYSTEM - FILLING AND DRAINING

For both instances, see Chapter 15.13.

11.2 RADIATOR

The tubular radiator with cooling laminations is of the overpressure type, the overpressure being maintained in it (and the entire cooling system) by the screw cap of the coolant tank. The radiator with the thermoswitch, the fan, and the supply and outlet hoses with the respective hose clips form an assembly unit.

The nominal cooling (radiator) output is approx. 29 kW/hr. (25,000 kcal/hr.). Radiator for subtropical and tropical regions is mentioned in Chapters 16.1 and 16.2.

Radiator Removal

1. Drain the coolant (remember that it is not water but an antifreeze) - see Chapter 15.13.

2. Proceeding from under the car, disconnect the radiator hoses from the main pipes under the car floor.

3. Remove the venting hose from clips along the circumference of the luggage boot and throw the hose over the luggage boot. Detach thermoswitch leads from the back side of the radiator.

4. Remove the radiator grille and the lower part of the forebody front panel - see Chapter 14.4.

5. Now remove two radiator fastening bolts from both headlamp spaces and lift away the radiator. Loosen the clip of the venting hose and pull the hose from the radiator.

Radiator Refitting

Reverse the above described procedure. Install the radiator on rubber pads and do not forget to slip a plain and a spring washer under the head of each fastening bolt. Use also spring washers when bolting down the fan ring (guard) if it has been removed from the radiator. Use a sealing ring when reinstalling the thermoswitch - for its tightening see Chapter 11.5.

For fitting new hose clips, see the Chapter 11.4.

The fan motor is described in Chapter 13.12.

11.3 COOLANT TANK AND SCREW CAP

The **tank** of plastic material is connected to the system according to the diagram in Fig. 11/1. It is closed with an overpressure screw cap and held in position with a yoke, the fastening nut of which is locked by a spring washer. A capscrew with a spring washer is used to hold down the tank bracket.

The **screw cap** sealed by a rubber gasket is provided with a valve for forming an overpressure in the cooling system (due to the warming up of the coolant) and a valve for forming an underpressure (due to the cooling down of the coolant) with the following values:

overpressure 0.04±0.01 MPa (0.4±0.1 kg/cm²)
underpressure 0.01±0.005 MPa (0.1±0.05 kg/cm²)

If defective, do not attempt to repair the screw cap but replace it with a new one.

11.4 RADIATOR TO ENGINE CONNECTING LINE

The water line consists of steel pipes and interconnecting rubber hoses. The hoses are held in position on the pipes by hose clips with the exception of the drain hose merely slipped

on to the coolant tank. Hose clips are formed either by metal strips or lengths of wire. When tightening the wire clips, take care not to damage the rubber of the hoses.

To Fasten Pipes and Hoses

A correct winding of the strip is important to ensure a self-locking clamping of the strip clips - see Fig. 11.4/1.

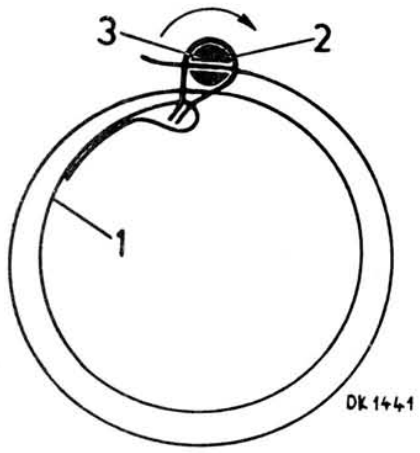


Fig. 11.4/1 - Diagram showing the threading of the clip strip through the clip clasp and the direction of rotation of the tightening cotter pin - the diagram has general applicability

1 - Strip clip, 2 - Clasp, 3 - Cotter pin

The main pipeline routed under the car floor consists of front and rear pipes. They are embedded in a channel moulded in the floor boards and rest on an insulating (polysterene) padding. From below, they are protected by a guard, the capscrews of which are locked in position by spring washers.

Use pipe holders (yokes) to fasten the pipeline to the floor. In the front and rear part of the car, tighten the pipes over the insulation pad and insert spring and plain washers under the nuts. Do not use insulation pads for bends forming the transition from the front and rear lower flat parts. Use spring washers under the heads of capscrews.

Before installing the pipes, prepare auxiliary yokes (or use lengths of wires attached to the provisionally screwed-in capscrews of the pipeline guard) to hold the pipes in the moulded channel in the floor before the final fastening of their guard.

The water line runs under the car together with other lines, pull-rods, etc. For their mutual relative arrangement see Chapter 12.7.

Removal

To make the underbody accessible for handling the pipes, place the car over a floor pit or on a ramp. The minimum required clearance is about 650 mm.

1. Remove the guards of the pipes and the fuel tank, lift away the spare wheel, and loosen the yokes holding the pipes to the floor.

2. Remove drain screws to drain the coolant from the pipes - see the illustration in Chapter 15.13.

3. Remove one hose clip in the middle of the car to disconnect the pipes (attention - the remaining coolant will flow out), and disassemble the line.

4. Disconnect the pipe ends from the hoses, and detach the pipes from the floor or other parts of the car.

5. Pull out the rear pipes passing them carefully around the various car parts.

6. Pull out the front pipes. Turn the front wheels into their left lock position, disconnect the steering linkage from the steering relay lever and the steering knuckle arm of the right-hand wheel, and push the linkage against the axle body. While removing the pipes, rotate the left-hand pipe clockwise (when viewing the car front end), and the right-hand pipe anticlockwise.

Reinstallation

Reverse the dismantling procedure when reinstalling the water line. While connecting the steering linkage, pay attention to the condition of ball pin sealing cups (fit new cups if the old are damaged). Fill in the recommended coolant and bleed the cooling system.

11.5 COOLANT TEMPERATURE CONTROL

Throughflow Thermostat

This thermostat shuts off the inlet of the coolant into the radiator during the engine heating-up period. It is mounted on the engine - see Chapter 2.3, par. 30.

The thermostat operates within the following values:

it begins to open at	80 ± 2 °C
it is fully open at	90 ± 4 °C
its lift at full opening	11 mm

When closed, it is permitted to let pass a maximum of 0.5 litres of coolant per minute, and it must not be closed by a back pressure of 0.16 MPa (1.6 kg/cm²).

When removing the thermostat by rotating the rivet in the valve disk, break away sedi-

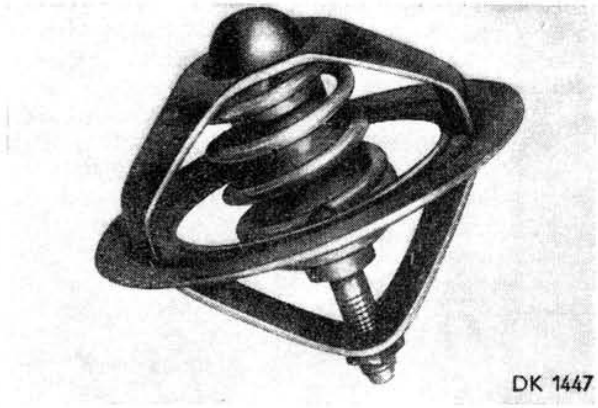


Fig. 11.5/1 - Throughflow Thermostat

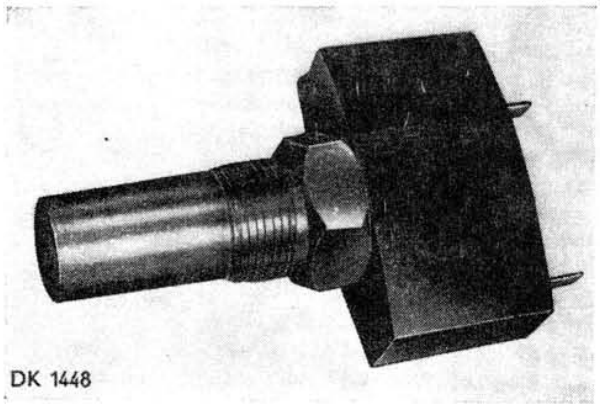


Fig. 11.5/2 - Switching Thermostat (Thermoswitch)

ments, if any. Do not attempt to repair a defective thermostat but replace it with a new one.

The thermostat for tropical regions is mentioned in Chapter 16.1.

Switching Thermostat (so-called thermoswitch)

Being mounted in the right-hand radiator header (see Chapter 11.2), it switches on the radiator fan. It must operate within the following limits:

it switches on the fan at	92±3 °C
it switches off the fan at	85±3 °C

A defective thermoswitch should not be repaired. For screwing it (tightening) in the radiator header, use a spanner applied to its hexagon and never to its head.

11.6 HEATER

Technical Description

The heater is an assembly unit consisting of the heating element - the heat exchanger, the fan, and the casing with ducts and flaps, in which these parts are housed. Other heater accessories are the control valve of the heating liquid inlet, the bracket with control levers, the air-venting or bleed hose, and the electric resistor for reducing the motor speed.

For the connection of the heater to the air distribution system in the car body see Chapter 11.7. The diagram of its connection to the engine cooling system is shown in Fig. 11.1. The heater fan is described in Chapter 13.13.

Heater fan output	250 m³/hr. at a pressure of 195 Pa (20 mm of water column)
Rated output of heater	4.6 kW/hr. (4,000 kcal/hr.)

Heater Removal

1. Drain the coolant from the cooling system - see Chapter 15.13.

2. Prise out the pin fastening the hose guard to the floor tunnel, loosen the capscrew on the top of the guard, slide it downward in the cut-out, and lift away the guard. Pull the corrugated air hose to detach it from the heater.

3. Disconnect the connectors from the terminal board (with the exception of the cable on the motor) in the luggage boot and disconnect the earthing cable with lug from the windscreen wiper bracket. Detach the bleed hose from the cock in the luggage boot.

4. Pull the grips (buttons) off the levers on the facia centre panel, remove the panel from the facia, and disconnect the terminal board of the disability warning flasher (if fitted on the car). Remove two capscrews holding down the levers on the panel, and lift away the panel.

5. Compress the corrugated air hoses on the sides of the heater to shorten them and lift them away.

6. Disconnect the heating liquid supply hoses.

7. Screw off the four nuts fastening the heater flange top to the bodywork and lift away the heater.

Heater Refitting

Reverse the described procedure of heater removal - paragraphs 7 to 1 - to refit the heater. Use plain washers under the fastening screws. Before refitting, drip several drops of oil into

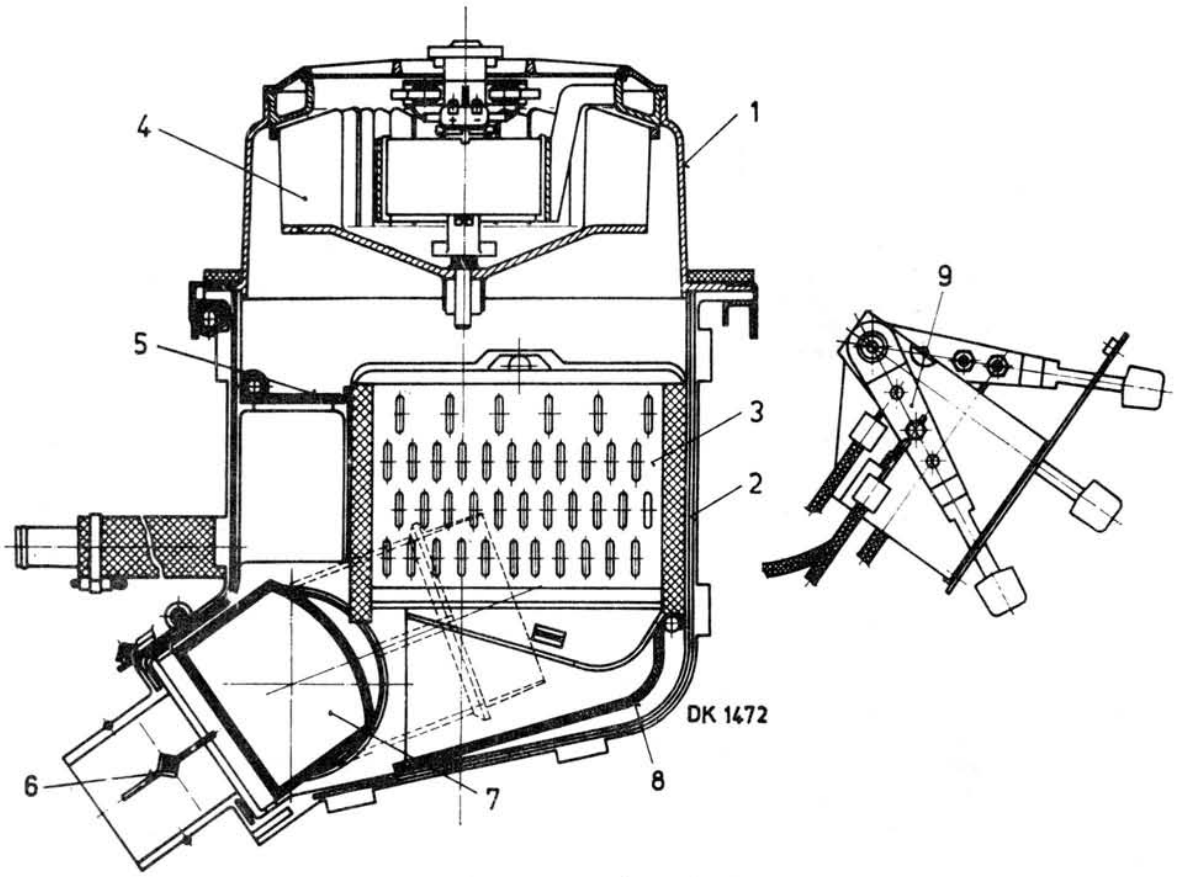


Fig. 11.6/1 - Section Through Heater

1 - Cover, 2 - Lower part of casing (jacket) - two-part, 3 - Heat exchanger, 4 - Heater fan, 5 to 8 - Control flap valves, 9 - Panel with control levers

the bowden tubing of the bowden cables and let the oil seep down along their entire length.

Check the heater fan for faultless running. With the switch in position I, the fan must run at higher speed - for its wiring refer to Chapter 11.7 - Electric Control. Fill the cooling system with coolant and bleed the system.

Fit the grips (buttons) on the levers observing the symbols on the grips:

left-hand lever - white arrows upward and downward,

centre lever - arrow downward,

right-hand lever - red arrow upward, blue arrow downward.

To open the flow through the lower inlet socket, turn the lever in this socket so that it coincides with its centre line. The socket should be closed with the flap only when testing the heater, etc.

Heater Disassembly and Reassembly

a) Heat exchanger, valve, flaps, and levers with links.

1. Disconnect the control bowden cables from the levers, remove the gasket from the heater bearing surface, loosen the locks of the braces, and lift away the braces together with the cover and fan.

2. Unscrew the liquid flow control valve and detach the hose from the second inlet of the heat exchanger and the bleed hose after having removed the hose clips. Do not detach the link from the valve lever - it will save you adjustment on reassembly.

3. Detach the link of the flaps from the rear side of the heater casing and unlock the flaps in the casing by removing lock rings, washers, and levers.

Remove the lock ring, washer and spring from the flap of the bottom socket, and lift away the ring.

4. Prise the clips out of the casing flanges and separate both halves of the lower casing.

5. If it is necessary to disconnect the side elbows, simply pull them out of the casing.

Proceed in reverse order when reassembling the heater. Use a sealing ring when installing the valve. Connect the links of the bowden cables to the levers as follows:

left-hand lever - link on the rear side of heater

centre lever - lever on the right-hand side of heater

right-hand lever - the first bowden cable from the pivot to the lever on the left-hand side of heater, the second bowden cable to the control valve.

Do not unnecessarily loosen the bowden cable link screws. Note or remember the position of links in the screws. If, on reassembly, this position is not known, tentatively locate the bracket with levers so that the surface at the grips includes an angle of 35 degrees with the heater centre line, and so that the top corner is about 40 mm above the upper plane of the heater fastening flange and at a distance of 150 mm from this flange, i. e. in the same position as in the car. Now set the levers on the bracket and the heater in their extreme (limit) positions, and lock the links in position with screws.

b) **Heater Fan**

From above, remove three capscrews with washers, lift away the grille, and take out the bracket with the fan. For the following disassembly of the impeller, the motor, and the bracket refer to Chapter 13.13.

On reassembly, install the fan and the grille so that they engage into the interlocking bosses of the cover and fan bracket.

c) **Resistor**

This is accessible after removing the fan from the heater cover. The resistor can be lifted away after removing its fastening screws on the outside of the heater casing cover.

11.7 HEATER CONTROL AND HOT AIR DISTIIBUTION

Distribution

Hot or cold air flows from the heater through corrugated flexible hoses and cavities provided for this purpose in the bodywork (in the front bulkhead and the floor tunnel). The hoses fitted on the outlet and distribution sockets are held in position by expanding.

The direction of air flow inside the heater is controlled by flaps.

Control

Electric control is provided by the resistor and switch in the heater casing cover designed for changing over the fan motor running speed.

The heater terminal board has the following connections: cable of the fan motor to the + (positive) pin, parallel blade to the thicker (yellow) cable from the switch, cross pin "1/2" to the thinner (red) switch cable. The motor is earthed by connecting the lug to the windscreen wiper bracket.

Mechanical control consists of levers on the facia (see Fig. 1.3/8), connected by means of bowden cables to levers of the heater flaps, and of a direct flap on the bottom of the heater (admission of air into the floor tunnel). Flaps of door window blowers are provided in the corners of the facia panel. Maximum heating: right-hand lever upward, centre lever downward.

Left-hand lever

When pointing upward, hot air blows on the windscreen, when pointing downward, it blows on the legs of the driver and passenger.

Centre lever

It directs the air flow through the heat exchanger (irrespective of the heat exchanger being heated or not) or closes the heat exchanger with the bottom flap. With this lever pointing downward, all the admitted air passes through the heat exchanger.

Right-hand lever

It regulates the air temperature by opening the valve of the heating liquid while closing the air passage outside the heat exchanger (flap beside the heat exchanger).

Lever pointing upward (red arrow) - maximum heater output; lever pointing downward (blue arrow) - heater put out of operation, admission of cold (fresh) air into the heater partially open (outside the heater).

Air Flow Regulation by the Motion of the Car

Air flowing to the rear seats from the heater can be controlled by the lever on the left-hand side of the bottom part of the heater; open – when the lever points downward, closed - when the lever is in its horizontal position (refer to information at the end of the chapter dealing with the installation of the heater into the car).

Blow-off ducts in the corners of the facia panel admit the air blowing off the front door windows.

11.8 HEATER CONNECTING LINE

The line is a combination of steel pipes and rubber hoses. All connections must be tightened with clips of the strip type (see Fig. 11.4/1) or the wire type (bleed hose). Take care not to overtighten the clips of the latter type as there is a risk of damaging the rubber.

The hose from the pipe of the thermostat body on the engine is routed to the heater through the floor tunnel, the return branch passing again through the tunnel to the pipe of the pump. Arrange the hoses along the sides of the floor tunnel so that they do not touch other parts in the tunnel.

For detailed information about the routing of the hoses refer to Chapter 12.7.

11.9 OIL COOLER

The oil cooler is standard equipment of Škoda 120 LS models. Its construction resembles that of the radiator. It is installed in the engine compartment (bay) and attached to the right-hand engine guard. Special pressure hoses connect it with the engine. Its connecting diagram is shown in Fig. 11.9/1.

As regards oil coolers for subtropical and tropical regions, refer to Chapters 16.1 and 16.2.

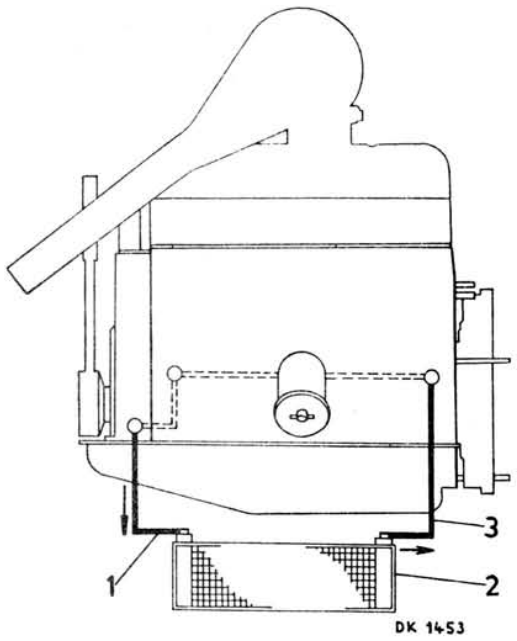


Fig. 11.9/1 - Oil Cooler-to-engine Connecting Diagram

1 - Outlet from engine-right-hand cooler socket, 2 - Oil cooler, 3 - Inlet into engine - left-hand cooler socket

Removal and Refitting

Disconnect the hoses from the engine and, according to circumstances and the purpose of the removal, detach the oil cooler from the engine guard or remove the engine guard together with the cooler and bracket. Empty the oil contained in the hoses and the oil cooler into a suitable vessel.

When refitting the oil cooler into the car, proceed in accordance with the circumstances of the removal. Secure the bolts conecting the oil cooler with the engine guard and the bracket (the bracket being located between the cooler and the guard) with spring washers. Bolt down the guard over plain washers and use a spring washer for the bolted connection of the bracket with the bodywork.

Use sealing washers when connecting hoses to the engine and the oil cooler, and put a sealing washer also under the bolt. Close the bolt of the engine port at the flange with the pressure switch. Fasten the hoses so that they are not stressed in their bends. The hose from the timing gear cover should be routed horizontally and the hose at the engine inlet so that it includes a downward angle of about 15 degrees with the horizontal plane. Top up oil in the engine.

11.10 COOLING SYSTEM DEFECTS, TESTING, REPAIRS, AND CLEANING

Defects and Testing

a) If there is a marked loss of coolant, check all connections for leakage. The loss of coolant can also be caused by a leakage of the radiator (or heater). If the leakage point is not visible, pressure-test the system without removing it from the car.

Admit sealed-off air at a pressure of 0.12 MPa (1.2 kg/cm²) into the filler neck and look for places where the coolant is seeping or dripping out. Inspect not only the radiator but also the heater.

An excessive loss of the coolant can be also caused by engine overheating. In that case, look for the cause of engine overheating.

b) Points to check if the engine is overheating
- coolant level
- operation of thermostats and radiator fan
- condition of radiator (whether clogged outside with dirt, or whether coated inside with scale)

c) Points to check if the engine does not warm up properly:
- operation of thermostats

Repairs

Generally, repairs are limited to the replacement of defective parts. The parts should be repaired only if no technical difficulties are involved. The radiator and heater can be repaired by soldering with tin solder. Then they should be filled with water and tested in accordance with the above instructions.

Cleaning

Clean the radiator and the entire cooling block outside with running warm water using a detergent (degreasing preparation) of any currently available brand.

For removing scale from the cooling and heater system, use any brand of scale-removing preparations while observing instructions for its use of its manufacturer. These preparations are usually concentrates, and if they are prepared on the basis of some acid (for example phosphorice acid), pour them into the water and not water into them when preparing their solutions.

After having drained the entire cooling system, flush it several times with water with the engine running (for the first flushing, it is recommended to use an additive with a neutralizing effect). Before draining the last water filling, check it by means of reagent papers. The reaction must be neutral (7 to 8 pH).

Flush the cooling system with the thermostat removed from the (running) engine and raise the idling speed each time for about 1 minute. It is sufficient to drain the flushing water by removing plug screws from the pipeline under the car (see Fig. 15.13/3) and the drain plug from the cylinder block (see Fig. 15.13/4). If the outflow is obstructed, clean the holes using a length of wire or another suitable tool.

12 - PEDALS, LEVERS, OPERATING RODS, CABLES, PIPELINES, FUEL TANK

12.1 BRAKE AND CLUTCH PEDALS

Both the brake and clutch pedal form a unit with their bracket which is also used for mounting master cylinders of the brake and clutch and, depending on the car equipment, also the brake booster.

Two switches are connected to the brake pedal, namely the stop-light switch and the switch for the warning light of an excessive brake pedal travel, signalling a defect of the brake system and resulting in a small reserve of the pedal travel for braking.

Removal and Refitting in Car

1. Loosen the connection of master cylinders with the bracket (remove nuts with spring washers) and/or the connection of the brake booster, and disconnect the switch leads.

2. Proceeding from inside the car, remove nuts with spring washers fastening the bracket to the car floor boards and lift away the pedal set.

Reverse the procedure when refitting the pedals. When replacing the pedals with a new set or if the pedals have been disassembled, it is necessary to adjust the pedal free travel.

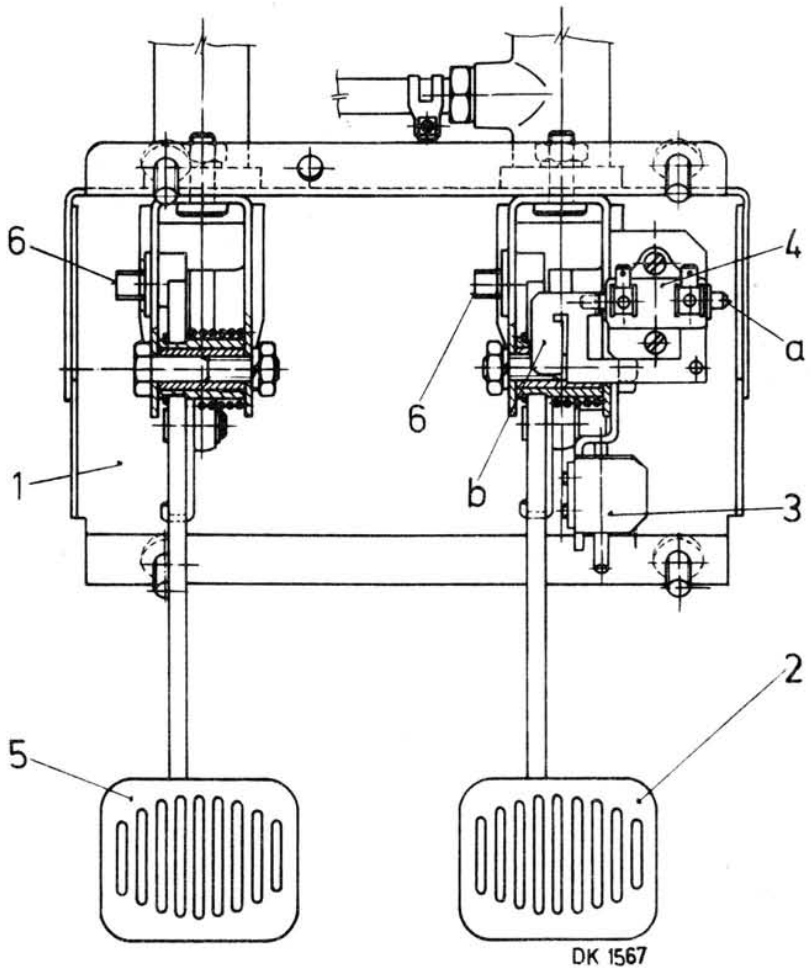


Fig. 12.1/1 - Brake and Clutch Pedal Mechanisms with the Respective Master Cylinders

1 - Bracket, 2 - Brake pedal, 3 - Stop-light switch, 4 - Brake pedal travel signalling switch: a) switch push button, b) switch push-button pawl (pin), 5 - Clutch pedal, 6 - Eccentric pins for pedal free travel adjustment (omitted with sets including brake booster)

Disassembly and Reassembly of Pedals

This is usually not necessary. The pedals can be disassembled after removing the axial screw in the pedal pin and slipping off the return spring. Do not remove the switches if it is not absolutely necessary - see adjustment. On reassembly, lubricate the pedal bush with lubricating grease of the same brand as used for the steering linkage - see Chapter 7.5, par. 3.

Pedal Free Travel Adjustment

Adjust the free travel of pedals assembled with master cylinders so that the pedal piston rod has a clearance of 0.5 to 1 mm when bearing against the piston heads of the master cylinders. The free travel of the pedal pad should be from 3 to 5 mm. It can be adjusted by rotating the eccentric pin on the pedal bracket - see Fig. 12.1/1.

For the adjustment of the brake pedal with brake booster and/or levelling of the brake pedal with the clutch pedal, see Chapter 9.6 – Adjustment.

Adjustment of Switches

The switches can be moved in the elliptical holes of the bracket after loosening the fastening capscrews with plain washers under their heads. A packing piece should be slipped under the switch of the brake pedal travel warning light and the pawl of the switch pin should be held down under the fastening capscrew.

Adjust the **stop-light switch** so that it switches on the stop lights at a pedal travel of 10 to 15 mm measured on the centre of the pedal pad.

Adjust the **pedal travel signalling switch** so that the pushed-in side push-button pin is released at a pedal travel of 100 to 110 mm measured on the centre of the pedal pad. Press the push button into the switch after having completed the adjustment.

12.2 ACCELERATOR PEDAL AND CABLE

The accelerator pedal forms a unit with its self-lubricating bearing and the lever. It is bolted to the floor tunnel. A cable passing through the tunnel is attached to the pedal lever and the relay lever on the engine by means of clamps. The cable is protected by a Bowden tubing.

Pedal Removing and Refitting

1. Loosen the clamp holding the cable on the engine-mounted relay lever.
2. Remove the capscrews holding down the bearing with the pedal, depress lightly the pedal, and lift it out of the floor tunnel together with the bearing.
3. Disconnect the pedal from the cable after loosening the clamp.

Removal and Refitting of Bowden Tubing and Cable

The Bowden tubing is fastened to the bracket in the floor tunnel by means of circlips. After their removal, pull the Bowden tubing inside the car.

On refitting the tubing, lubricate it with a low-viscosity oil (of the SAE 20 class). It has been lubricated with grease in the factory. Fit the clamps so that their longer parts (from the screw to their end) are on the side of the levers.

Accelerator Cable Adjustment

Adjust the cable so that it is not excessively tensioned or too slack. Loosen the clamps on the engine side of the cable, move slightly the clamp toward the relay lever, and tighten the screws of the clamp.

12.3 GEAR SHIFT LEVER AND LINKAGE

The gear shift mechanism consists of two units: the gear lever with its housing and accessories, and the gear shifter rod and the shifter link with joint (at the gearbox) for damping the vibration of the power pack transmitted to the gear lever.

Removing Gear Lever Housing and Link

1. Lift away the mat from the floor tunnel in the front and rear compartment. If separate, remove the individual floor mats after having prised out their clips with a screwdriver or a similar tool. If a one-piece floor covering is used, remove the door sill strips on one side, tip the seat, and bend over the floor covering.
2. Remove the gear lever housing capscrews and prise out the lid (next to the clip) between the seats. Proceed through the aperture to disconnect the bolted connection of the link with the housing shifter rod.
3. Lift away the housing with the lever through the aperture. Swivel the lever so that the shifter rod does not protrude over the housing bearing thus obstructiong the removal.
4. Usually it is not necessary to remove the gear shift link from the car. If absolutely necessary, the link can be disconnected only after

having removed the power pack from the car – see Chapter 4.1.

The link disconnected from the gear lever housing can be then pulled out of the floor tunnel in the rearward direction.

Refitting Gear Lever Housing and Link in Car

Reverse the above-described procedure when refitting these parts. Lubricate thoroughly the housing before its reinstallation – see Chapter 15.9. The following several hints should be useful:

1. When reconnecting the link with the shifter rod, put a rubber washer under the respective nut and lock this nut in position using a lock nut – hold the fastening nut in a spanner and tighten the lock nut using another spanner.
2. After having connected the link to the gearbox, move the gear lever housing on the floor tunnel so that the gear lever is perpendicular to the tunnel when shifted in the neutral and only then fasten the housing. Use plain washers under the heads of the capscrews.

Disassembly of Gear Lever Housing

1. Slip the rubber boot off the housing and lift away the gear lever after having removed the capscrews of the cover. This disassembly is sufficient when lubricating the gear lever housing.
2. To complete the disassembly, remove the circlip at the spring and screw of the gear lever sleeve.

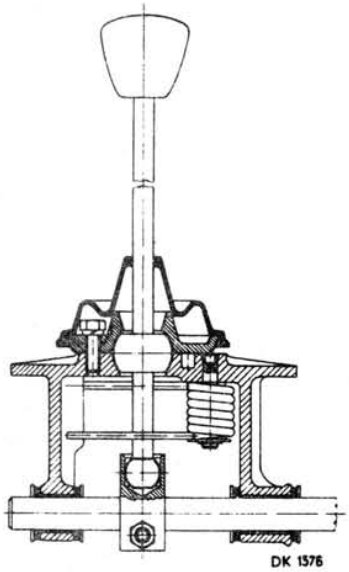


Fig. 12.3/1 – Sectional View of Gear Lever Housing

Reassembly of Gear Lever Housing

Replace damaged bushes with new ones. After their pressing on, check the lugs for alignment by threading the shifter rod through them. Any misalignment can be corrected by twisting the lugs.

For reassembly, reverse the disassembling procedure. Coat with lubricating grease the spherical surfaces of the gear lever and housing, the bore in the shifter rod sleeve, and the bearings of the lugs. Dip the felt rings of the lugs in oil.

12.4 CHOKE LEVER AND CABLE

If no proper access can be gained to the fastening of the bracket on the tunnel by peeling off the respective part of the floor mat, remove the entire mat in accordance with Chapter 12.3. Loosen the fastening on the carburettor, remove the sheet guard of the fuel tank and the cover of the air duct. Then lift away the entire assembly from the car. When refitting the choke cable, proceed in reverse order.

For its arrangement under the car, see Chapter 12.7.

When fastening the cable to the carburettor lever, tip the lever toward the tunnel.

12.5 HAND BRAKE LEVER AND CABLES

For removal, refitting, and adjustment see Chapter 9.8.

12.6 FUEL TANK AND FUEL LINE

The fuel tank is arranged under the floor, in the space under the rear seats. The tunnel shaped elevation in its bottom part divides it into two sections interconnected by a transverse hose.

The filler neck in the side of the car (rear wing) is connected with the tank by a filling and venting hose.

Removal of Fuel Tank from Car

For this job, it is recommended to place the car over a floor pit or on a ramp.

1. Disconnect the cables of the choke and the accelerator from the engine. If the car has a brake booster, disconnect the hose from the intake manifold. Pull the parts down under the car.

2. Proceeding from below, remove the fuel tank sheet guard and the guard of the cooling water pipes.

3. Disconnect the pipe of the clutch hydraulic line from the clutch release hose bracket.

4. Screw out drain plugs to drain fuel from the fuel tank and at the same time disconnect the fuel hose from the fuel pump. After completing the draining, reinstall the drain plugs (screws) with their sealing rings.

Disconnect the transverse hose connecting both sections of the fuel tank and stop the open pipes with rubber plugs (to prevent the remaining fuel spilling over your hands and clothes when lifting the tank away).

5. Disconnect the gear shift link and the speedometer drive from the gearbox - see Chapter 4.1, par. 9.

6. Detach cables from the hand brake rocker and pull them out from under the car - see Chapter 9.8.

7. Drain the cooling system - see Chapter 15.13. Disconnect the main water line in the middle of the car. Disconnect the pipes from the engine (from the hose of the thermostat and the pump connecting hose) and remove the pipes - see Chapter 11.4.

8. Disconnect the hose of the fuel tank from the fuel filling pipe, and, in the upper part, the hose of the fuel filling line vent pipe.

9. Sever the electric connection of the fuel level gauge float system under the right-hand rear seat.

10. Use a jack to support the gearbox and loosen the connection of the gearbox cross bearer with the bodywork.

11. Loosen the capscrews fastening the fuel tank to the bodywork and lower the jack to tip the power pack. Retain the fuel tank while removing the capscrews, move the tank backwards and down, tip it down and forward, and remove it in this direction.

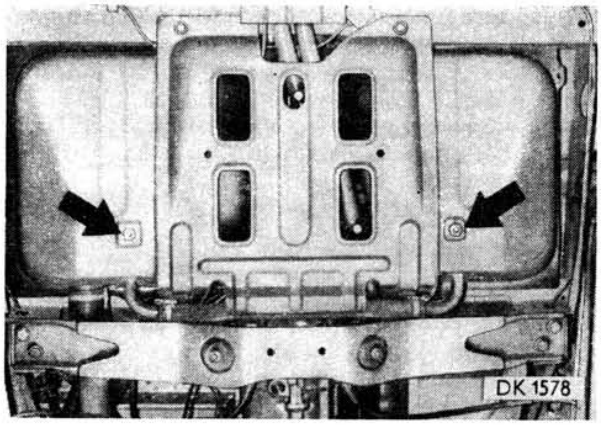


Fig. 12.6/1 - Fuel Tank Drain Plugs

12. Should the pipes of the brake system obstruct the removal of the tank, disconnet them from the final drive and from brake hose brackets.

Refitting Fuel Tank in Car

Reverse the procedure of the tank removal. Fill the cooling system with the recommended coolant and bleed it, adjust the hand-brake and the accelerator cables. Bleed the clutch hydraulic line and also the rear wheel brakes if the hydraulic brake line has been disconnected.

Tighten properly all joints and connections, fasten the cables, links, and pipes observing their correct arrangement - see Chapter 12.7.

Fuel Line and Its Accessories

Filling pipe. This is a sheet - metal tube attached to the hose on the fuel tank by means of a clip, and to the bodywork by two holders with a capscrew and both a spring and a plain washer. It passes through a bushing in the side of the bodywork.

Venting line. The hose is attached to the fuel tank filler neck in the upper part of the tank and to the filling pipe by means of clips. For its passage through the bodywork stiffener, see Fig. 12.7/4.

For clips and their tightening see Fig. 11.4/1.

The air-feed hose is slipped on the filling pipe outlet at the fuel tank neck; its loop is inserted under the damping lining of the bodywork, and its other end is inserted into the hole of the filling pipe socket bushing.

Filler neck cap - see Chapter 1.5.

Fuel gauge - see fuel reserve signalling switch, Chapter 13.17.

12.7 ARRANGEMENT OF PIPELINES, LINKS, AND CABLES UNDER THE CAR

The routing, fastening, etc., of pipelines, links, and cables is described in chapters dealing with these parts. They all leave the floor tunnel under the fuel tank to be covered by a guard held in position by self-locking nuts with plain washers. The following illustrations show their correct arrangement which has to be maintained if incorrect function or damage is to be prevented. It is imperative to ensure free movement and swing of the gear shift link.

Secure the correct position of all parts under the fuel tank by clips which have to be provided with sleeves preventing damage to Bowden tubings, etc. The overall arrangement is shown in Fig. 12.7/2 and 12.7/3.

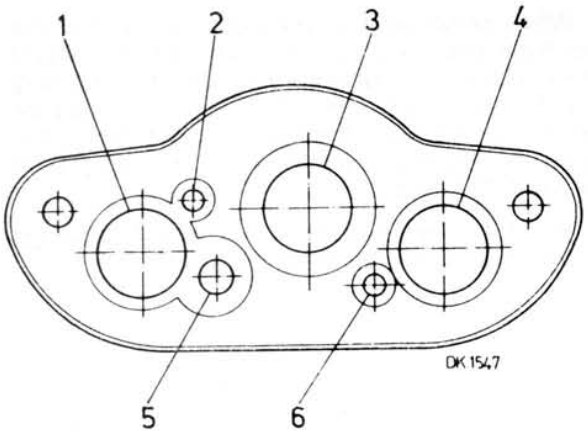


Fig. 12.7/1 - Arrangement of Passages through Floor Tunnel Cover (when viewed from rear)

1 - Heater hose, 2 - Accelerator Bowden cable, 3 - Gear shift link, 4 - Heater hose, 5 - Speedometer shaft, 6 - Choke Bowden cable

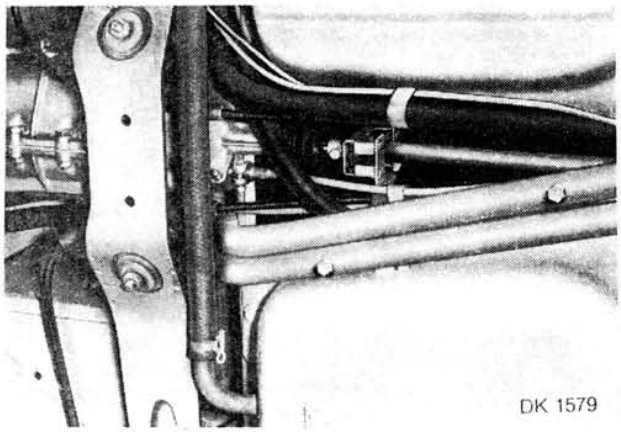


Fig. 12.7/2 - Overall View of Arrangement of Links, Pipelines, etc., under Fuel Tank

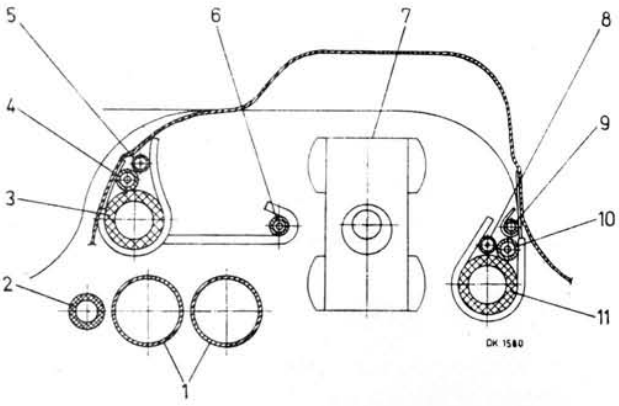


Fig. 12.7/3 - Layout Diagram of Links, Pipelines, etc., under Fuel Tank

On the left:

1 - Cooling system pipes, 2 - Underpressure hose of brake booster (depending on car equipment), 3 - Heater hose - outlet (connection to pump), 4 - Hand-brake Bowden cable, 5 - Accelerator Bowden cable, 6 - Speedometer shaft

On the right:

7 - Joint of gear shift link, 8 - Choke Bowden cable, 9 - Pipe of clutch hydraulic system (supply of hydraulic fluid to clutch release mechanism), 10 - Hand-brake Bowden cable, 11 - Heater hose - supply (connection to thermostat)

Heater hoses are crossed under the car as shown in Fig. 12.7/2 and pass over each other as shown in Fig. 12.7/4.

In the area of the battery case, the choke bowden cable is attached to the cooling system pipes by a special plastic clip. When removing the pipes, cut the clip with shears and use a new one for reassembly.

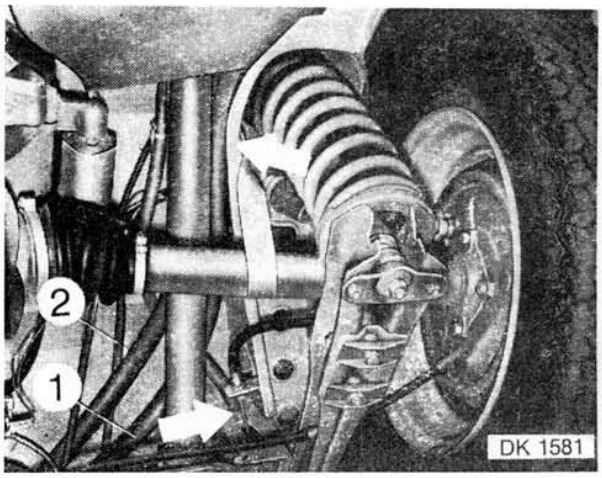


Fig. 12.7/4 - Routing of Hoses under the Body Rear Part

1 - Heater hose - outlet - it is below the point marked with the arrow, 2 - Heater hose - supply, 3 - Fuel tank venting hose - it passes through the bodywork stiffener in the point marked with the arrow

12.8 SPEEDOMETER DRIVE SHAFT

The shaft passes from the speedometer through bushes in the bodywork panels into the space housing the brake and clutch master cylinders (in the case of left-hand steering), returns into the bodywork, runs along the left-hand side of the floor tunnel and passes into the tunnel through the tunnel rear end, and fi-

nally emerges into space under the floor toward the gearbox. It is attached to the speedometer by means of a union nut and to the gearbox by a sleeve and a screw.

It is lubricated with oil from the gearbox which creeps along it due to capillary elevation. Lubricate it with engine oil of a lower viscosity dripped into its sheath only if the lubrication by creeping is inadequate.

When refitting it in position, put it into the car from the front, connect its both ends, and then arrange it so that it does not form any sharp bends and is not too taut. The speedometer can be disconnected after removing the instrument panel, and removed by pulling it in forward direction.

For the speedometer drive shaft passage under the floor refer to Chapter 12.7.

13 - ELECTRICAL EQUIPMENT

Technical Description

The rated voltage of the electric supply and electric devices is 12 volts (the service voltage being 14 volts) for d. c. operation. The wiring is of the so-called single-lead system, i. e., one lead or conductor (negative pole) is formed by the car metal structure, the other by cables.

The current supply is formed by the alternator with a rectifying system operating in conjunction with the storage battery and the voltage regulator.

The general working principles when doing jobs on the car which interfere with the electrical equipment are disconnecting of the battery earthing (negative) pole, as well as perfect cleanness and a proper tightening of all electric connections. For other measures which have to be observed when handling battery cable connections, see Chapter 13.3 - Alternator.

13.1 WIRING, FUSES

Beside several free leads, the main part of the wiring is the fuse box with bunched cables and ignition harness. The cables branching to the individual electric devices are SYA 0.75 - 6 mm² cables either with free ends without cable shoes, or terminated by female connectors, or grouped in a terminal board. Battery and engine earthing conductors are special braided copper strips. The positive cable of the battery has a section of 16 mm².

The fuse box should never be separated. Should it be necessary to install new bunched conductors, the terminal board for the windscreen wiper has to be mounted additionaliy (the bunch with the fitted terminal board does not pass through the aperture).

WIRING, CONDUCTORS

Installing and Removing Bunched Conductors

After having disconnected the electrical devices (and the terminal board of the windscreen wiper in the front part) and after having freed the conductors from clips, pull the bunched conductors into the car towards the fuse box. The fuse box can be removed after screwing off the nuts of the fastening bolts.

When installing the bunched conductors, reverse the procedure, and do not omit to put plain and spring washers under the bolts of the fuse box. Work carefully and without using force so as not to damage the insulation of the conductors. All through-holes must be provided with grommets.

In the luggage boot, the bunched conductors are routed along its top on the left hand side and pass to the right-hand side behind the radiator. The other branch runs along the partition in the luggage boot rear part.

Inside the car, the bunched conductors run behind the facia panel and branch to the door switches and dome lights. They pass through the car on the right-hand side of the floor tunnel to the space above the power pack and into the engine compartment to end at the tail lights.

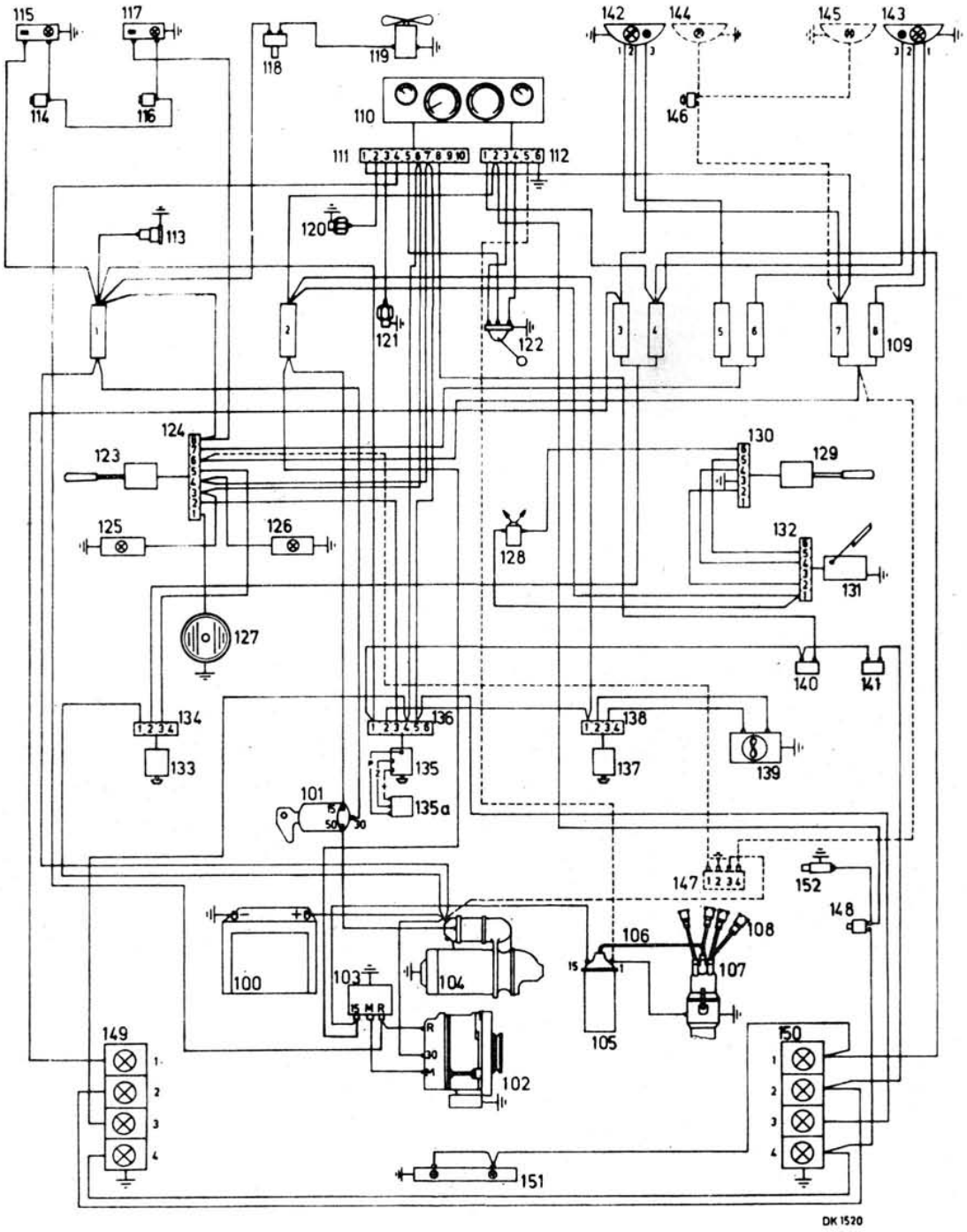


Fig. 13.1/1 - Wiring Diagram

100 - Storage battery
101 - Switch box
102 - Alternator
103 - Voltage regulator
104 - Starter motor
105 - Ignition coil
106 - Ignition cable
107 - Distributor
108 - Ignition harness and sparking plug interference suppressing resistors
109 - Fuses
110 - Instrument panel
111 - Instrument panel terminal board
1 - High-beam warning lamp, 2 - Lubrication warning lamp, 3 - Telethermometer, 4 - Alternator (charging) warning lamp,

5 - Fuel reserve warning lamp, 6 - Warning lamp of left-hand direction indicators, 7 - Warning lamp of right-hand direction indicators, 8 - Brake system warning lamp, 9 - Fog lamp warning lamp (optional extra), 10 - unoccupied

112 - Instrument panel terminal board
1 - Instrument illumination, 2 - Lead-in from fuse No. 2, 3 - Fuel gauge (yellow), 4 - Fuel gauge (blue), 5 - Tachometer, 6 - Earthing

113 - Receptacle

114 - Door switch, left-hand

115 - Dome lamp, left-hand, with hand-operated switch

116 - Door switch, right-hand

117 - Dome lamp, right-hand, with hand-operated switch

118 - Radiator fan motor switch (automatic thermoswitch)

119 - Radiator fan motor

120 - Oil pressure warning lamp switch

121 - Telethermometer primary element

122 - Fuel reserve warning lamp switch

123 - Direction indicator and horn switch, dipswitch

124 - Terminal board
1 - Horn, 2 - Direction indicator ticker feeder, 3 - Direction indicators, left-hand, 4 - Direction indicators, right-hand, 5 - Dipswitch (bunched conductors "56"), 6 - High beam, 7 - Low beam, 8 - Lead-in from fuse No. 1

125 - Direction indicator, front, left-hand

126 - Direction indicator, front, right-hand

127 - Horn

128 - Windscreen washer motor

129 - Switch of windscreen washer and wiper motors

130 - Terminal board
1 - Unoccupied, 2 - Windscreen wiper motor (bunched conductors "2"), 3 - Earthing, 4 - Wiper motor (bunched conductors "4"), 5 - Wiper motor (bunched conductors "5"), 6 - Windscreen washer motor

131 - Windscreen wiper motor

132 - Terminal board
1 - Lead-in from fuse No. 2; 2, 4, and 5 - Switch (bunched conductors "2", "4", and "5")

133 - Parking light switch and high beam feeder

134 - Terminal board
1 - Feeder, 2 - Clearance (side) lights, 3 - High beam

135 - Switch of disability lights with direction indicator ticker

136 - Terminal board
1 - Lead-in from fuse No. 1; 2 - Lead-in from fuse No. 2; 3 - Feeder of direction indicator circuit breaker, 4 - Direction indicators, left-hand, 5 - Direction indicators, right-hand

137 - Heater motor switch

138 - Terminal board
1 - Lead-in from fuse No. 2; 2 - Heater motor (high speed), 3 - Heater motor (low speed)

139 - Heater motor

140 - Brake system warning lamp switch

141 - Stop light switch

142 - Headlamp, left-hand

143 - Headlamp, right-hand
1 - High beam, 2 - Low beam, 3 - Parking light

144 - Auxiliary headlamp, left-hand

145 - Auxiliary headlamp, right-hand

146 - Auxiliary headlamp switch

147 - Auxiliary headlamp switching relay

148 - Reversing lamp switch

149 - Tail lamp cluster, left-hand

150 - Tail lamp cluster, right-hand
1 - Tail lights, 2 - Stop lights, 3 - Direction indicators, 4 - Reversing lamps

151 - Licence plate light

152 - Carburettor jet electromagnetic separator

Note:

The wiring diagram and the description of the connection of bunched conductors is universal. The actual bunched conductors include only leads corresponding to the car basic (standard) equipment so that there are certain differences between the ŠKODA 105 S, 105 L, and 120 LS models.

TYPE: S 105/120, 120 LS, 120 GLS

Electrical Equipment 1980 model

WIRING DIAGRAM

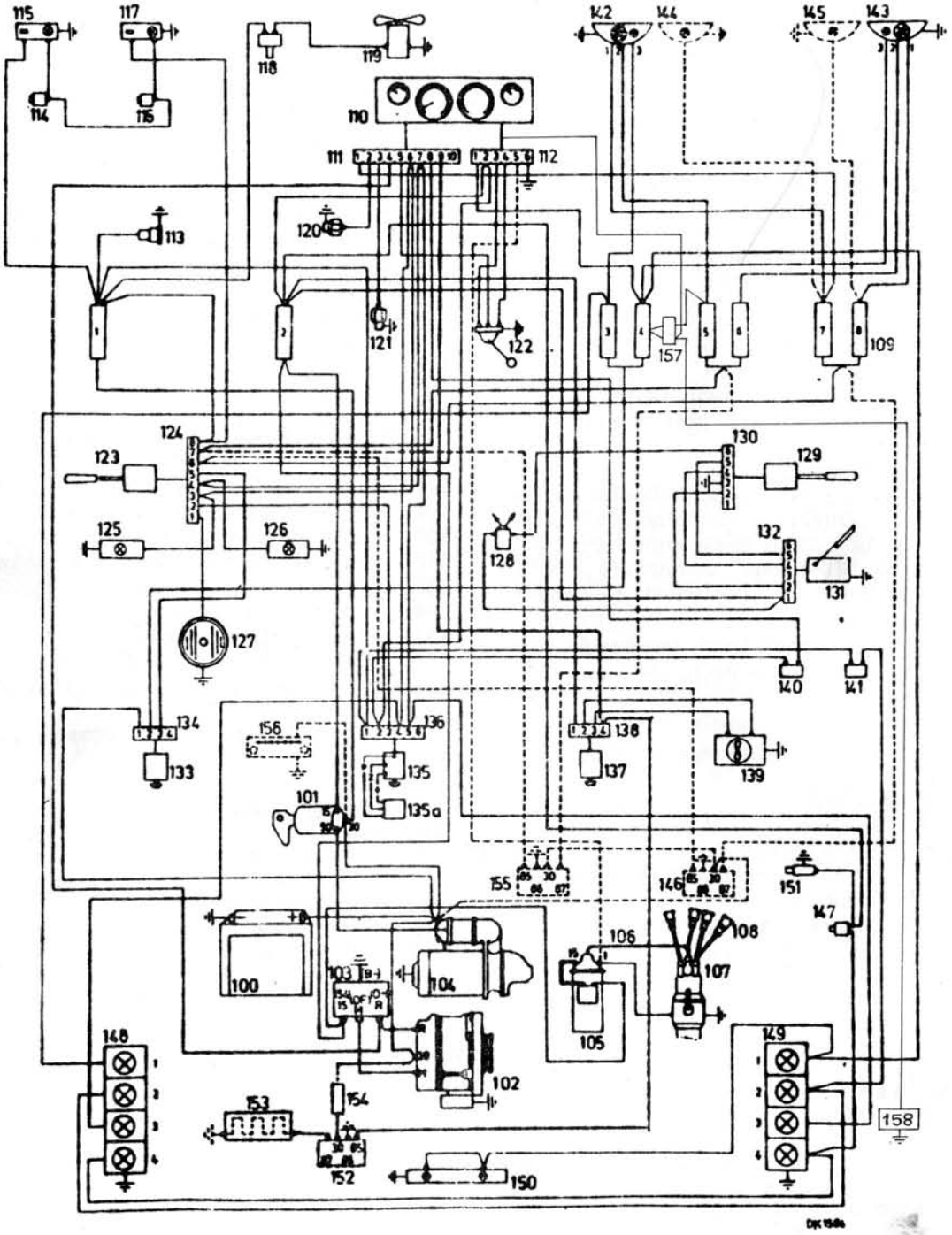


Diagram 13,1/1A

WIRING DIAGRAM SINCE OCTOBER 1979

Diagram 13.1/1A
Other positions as on 131/1

146 – Switching relay of headlamps and auxiliary headlamps 2/
147 – Reversing lamp switch
148 – Tail lamp cluster, left-hand.
1 - Tail lights, 2 - Stop lights, 3 - Direct indicators, 4 - Reversing lamps
149 – Tail lamp cluster, right hand
150 – Number plate light
151 – Carburettor electromagnetic valve
152 – Rear window defroster switching relay
153 – Heater rear window (defroster) 1/
154 – Fuse of heated rear window (defroster)
155 – Dipped beam switching relay 2/
156 – Car receiver 3/
157 – Rear FOG Switch
158 – Rear FOG Light

WIRING OF ELECTRIC DEVICES

The overall wiring diagram is shown in Fig. 13.1/1, the wiring diagram of the fuse box in Fig. 13.1/2. The following survey specifies the connections of conductors in accordance with their colour and/or numerical symbols, etc. They are listed in a direct sequence from the headlamps to the tail lights, showing the successive branching of the main wiring harness.

a) **Connections of bunched conductors**

1. **Right-hand headlamp, or headlamps**
low beam . . . black - without cable shoe
high beam . . . yellow - without cable shoe
clearance (side) light . . . red - female connector 5.5
auxiliary headlamp . . . yellow - female connector 7

2. **Left-hand direction indicator**
black - female connector 5.5

3. **Radiator fan thermoswitch**
yellow - female connector 7

4. **Left-hand headlamp, or headlamps**
see point 1.

5. **Direction indicator - horn**
direction indicator . . . . black - female connector 5.5
horn . . . . . black - hot

6. **Switching relay of auxiliary headlamps**
yellow — female connectors 5.5 with symbols "1", "3", "4" to be connected to symbols "1", "3", and "4" of the relay

7. **Receptacle** (or the cable is incorporated in branch "8")
yellow - female connector 5.5

8. **Windscreen wiper terminal board**
Conductors with symbols "1", "2", "4", and "5" to be connected to the respective numbers of the terminal board or opposite to conductors of the same colours on the wiper terminal board

9. **Heater motor**
yellow - female connector 5.5 to symbol "+"
red - female connector 5.5 to symbol "1/2"

10. **Windscreen washer motor**
red - female connector 7 to symbol "+" on motor
yellow - female connector 7 to symbol "–" on motor

11. **Switch of auxiliary headlamps**
yellow (double) - female connector 5.5 to headlamps
yellow - female connector 5.5 to switch

12. **Door switch,** left-hand
yellow – female connector 5.5

13. **Dome light,** left-hand
green – female connector 5.5
red female connector 5.5

14. **Fuse box**
Central connection of conductors - do not separate them from the bunch!

15. **Direction indicator switches, dip switch, and horn switch**
eight-pole terminal board
six-pole terminal board

16. **Parking light switch and high beam feeder**
four-pole terminal board

17. **Switch box**
female connectors 5.5 with symbols "15", "30", and "50" to be connected to symbols "15", "30", and "50" on the switch box

18. **Instrument panel**
ten-pole terminal board
six-pole terminal board
earthing cable with lug

19. **Heater switch**
four-pole terminal board

20. **Switch of disability lights**
six-pole terminal board

21. **Door switch, right-hand**
green – female connector 5.5

22. **Dome light, right-hand**
green – female connector 5.5
red – female connector 5.5

23. **Stop switches**
forked (yellow) –
female connectors 5.5 . upper and lower switch
red –
female connector 5.5 . upper switch
white –
female connector 5.5 . lower switch

24. **Fuel gauge**
black – female connector 5.5
yellow – female connector 5.5
blue – female connector 5.5
to be connected to the respective pins (blades) of the same colour of the fuel gauge

25. **Starter motor, reversing lamp switch**
conductors with lugs . starter motor main terminal board
cylindrical (pin) connector . . . . . starter motor control switch
green –
female connectors 5.5 . headlamp switch

26. **Oil pressure gauge, thermometer, carburettor jet separator**
green –
female connector 5.5 . pressure gauge
yellow –
female connector 5.5 . telethermometer primary element
green –
female connector 7 . . carburettor jet separator

27. **Ignition coil, voltage regulator, alternator, tachometer**
conductor with female connector and branching lug .
female connector – regulator terminal 15/54
lug – ignition coil terminal 15
blue – female connector 5.5,
symbol "R" . . regulator terminal "R"
yellow – female connector 5.5,
symbol "M" . . regulator terminal "M"
blue –
connector "R" . alternator terminal "R"
yellow –
connector "M" . alternator terminal "M"
lug . . . . . terminal "+B"
conductor with
lug . . . . . ignition coil terminal "1" (tachometer operation)

28. **Tail lamp cluster, right-hand**
yellow –
female connector 5.5 . tail light
black –
female connector 5.5 . direction indicators
red –
female connector 5.5 . stop light
green –
female connector 5.5 . reversing lamp

29. **Licence plate light**
conductors with female connectors 5.5

30. **Tail lamp cluster, left-hand**
se point 28.

b) Connection of free conductors

1. **Storage battery**
battery cable positive (+) terminal – starter motor
battery earthing strip negative (–) terminal – bodywork (earthing conductor)

2. **Engine**
engine earthing strip (fastening lug) – engine cross bearer (earthing conductor)

3. **Distributor**
special cable from distributor to ignition coil; end with interference suppressing terminal to distributor
cable from distributor to ignition coil terminal "1"

ignition harness from distributor to sparking plugs –
for their connection see Chapter 2.3, par. 48

4. **Standard earthing cables**
   - separate:
     voltage regulator - bodywork
     horn - horn fastening screw
     switching relay of auxiliary headlamps - bodywork
   - cables as accessories of electrical devices: headlamps, windscreen wiper, tail lamp clusters, front direction indicators, licence plate light, heater motor, radiator fan motor–bodywork (headlamps to headlamp supporting metal sheet)

FUSE BOX

The fuse box is installed to the left under the facia. The screw of the lid can be unscrewed with the fingers. The fuses are rated for 15 amperes. Fuse No. 1 is to the left, the following fuses are counted in direct sequence from 1 to 8 to the right.

Connection of Electrical Devices to Fuses No. 1 to 8

1 - receptacle; dome lights; horn; disability lights; stop lights; radiator fan motor; brake system warning lamp
2 - windscreen wiper motor; heater motor; direction indicators; fuel gauge and fuel reserve warning lamp; alternator (charging) and engine lubrication warning lamps; windscreen washer motor; reversing lamps; carburettor jet separator
3 - tail light, left-hand; clearance (side) light, left-hand
4 - tail light, right-hand; licence plate light; clearance (side) light, right-hand; instrument illumination
5 - headlamp, left-hand, low beam
6 - headlamp, right-hand, low beam
7 - headlamp, left-hand, high-beam and high-beam warning lamp; auxiliary headlamps
8 - headlamp, right-hand, high beam

13.2 STORAGE BATTERY

Location and Removal

The battery is located under the interior luggage compartment. Tip the left-hand backrest of the rear seat, lift the mat, and remove the left-hand cover in the luggage compartment floor board. Disconnect the terminal of the earthing strip and the terminal of the lead to the starter motor. Grip the protrusions on the shorter sides of the battery upper part and lift away the battery. To facilitate its removal, it is recommended to use hooks made, for example, from hoop steel or a special removing handle made by various manufacturers for the specific type of storage battery.

Installation

Tighten the nuts of the battery bracket bolts only so as to obtain a slight stressing. Excessive tightening is apt to result in a distortion of the battery jar and in damage to the battery.

Battery Type and Battery Maintenance

The car is equipped with the type AKUMA 12 V/27 Ah, model 6 N 37 lead battery. The electrolyte used is battery sulphuric acid of a specific gravity of 1.28 (32 °Bé), for tropical regions of 1.23 (27 °Bé). The battery is filled with about 2.7 litres of electrolyte.

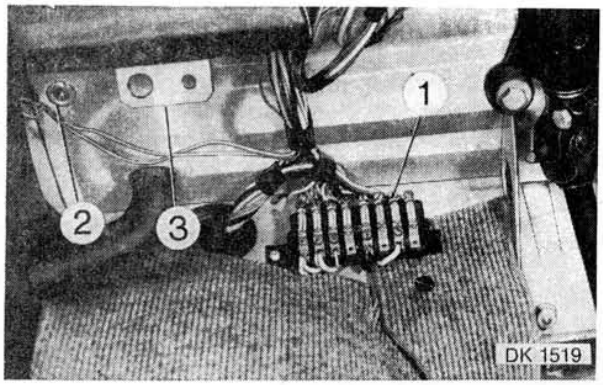


Fig. 13.1/2 - Protection of Electric Circuits by Fuses; Receptacle

1 - Fuses–fuse box lid removed, 2 - Receptacle, 3 - Panel for auxiliary switches, etc.

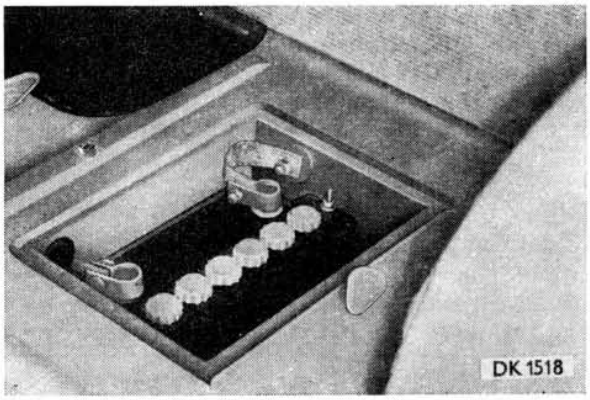


Fig. 13.2/1
Location of Storage Battery in Car

Observe strictly the following instructions:

1. Maintain the electrolyte level at the level of the perforated inserts between the plates or so that the inserts are covered with the electrolyte to a maximum height of 4 mm. The bottom limit of the electrolyte level is 3 mm below the perforated inserts. Use only distilled water for topping up the electrolyte. Add electrolyte only if it has been obviously spilt from the battery. In such case, its density must correspond to the density of the electrolyte remaining in the battery.

2. Keep the battery terminals clean, remove oxides occasionally, and coat the terminals with mineral jelly.

3. Wipe off the electrolyte spilt over the battery surface since it is conductive and causes discharging of the battery.

4. Check the charging of the battery according to the electrolyte density or check the voltage drop using a voltmeter with a loading resistor and comparing the obtained reading with an evaluation table or scale.

5. When charging the battery outside the car, use charging current values according to the table. The voltage should be controllable in the range from 12.6 to 16.8 volts. The fully discharged battery is fully charged in about 13 to 20 hours when

a) the electrolyte attains a density of 1.28 in all cells and does not change in a period of two hours;
b) the cell voltage (measured with applied current) attains a value of 2.6 to 2.7 volts and does not change within two hours of continued charging;
c) all cells are lively gassing.

6. An already used battery must not be left without electrolyte or discharged as it is apt to suffer from such a condition.

7. The battery in an unused car must be removed and charged outside the car within three months at the latest. If the car is under repair for a prolonged period, take all necessary steps to keep the battery in good condition.

Battery Charging versus Electrolyte Density

Specific gravity (density) g/cm³	Charging	Electrolyte freezing temperature
1.28	100 %	−60 °C
1.24	70 %	−50 °C
1.22	50 %	−35 °C
1.15	20 %	−17 °C
1.12	0	−12 °C

At a 20 per cent charging, the battery is considered practically discharged.

Table of Charging and Discharging Values

Rated voltage	12 volts
Rated capacity C 20 at a 20-hour discharging to 1.75 volts per cell	37 amperehours
Normal discharging current for 20-hour discharging to 1.75 volts per cell	1.75 amperehours
Normal uniform charging	3.7 amperes
Two-stage charging:	
stage I up to 2.4 volts per cell; gassing beginning	4.4 amperes
stage II up to final marks of fully charged condition	2.2 amperes

Different instructions, determined specifically by battery manufacturers, apply to making a new and empty battery ready for operation or to so-called quick charging.

Safety Precautions and Other Measures

During charging, the electrolyte temperature must not exceed +40 °C. As soon as this temperature is reached, interrupt the charging or lower the charging current (this applies especially to so-called quick charging).

During charging, an explosive mixture of hydrogen with oxygen is liberated from the electrolyte. Therefore, the area where the battery is charged must be ventilated, and it is forbidden to approach with a naked flame (or spark) the cell filling holes (even after a considerable period of time after the charging has been completed).

When charging the battery, open the filling holes of its cells to enhance degassing.

The electrolyte is an acid harmful to the skin and clothes as well as to parts of the car finished in enamel. Rinse with water immediately any contaminated spots.

13.3 ALTERNATOR

The alternator is a three-phase generator with a built-in semiconductor rectifier for feeding electrical devices and the battery with direct current.

Alternator Installation and General Instructions

They apply to both alternator models. The following principles should be observed:

Technical Data of alternators with Regard to Car Models

(a) PAL-MAGNETON	443.113-516.021	443.113-516.121	443.113-516.181
Service voltage Charging begins at Current at 2.600 r.p.m. (warmed up)	14 V 1.000 r.p.m. 26 A	14 V 1.000 r.p.m. 31 A	14 V 1.100 r.p.m. —
Current at 2.700 r.p.m. (warmed up) Maximum current Maximum speed	— 35 A 10.000 r.p.m.	— 42 A 10.000 r.p.m.	37 A 55 A 10.000 r.p.m.

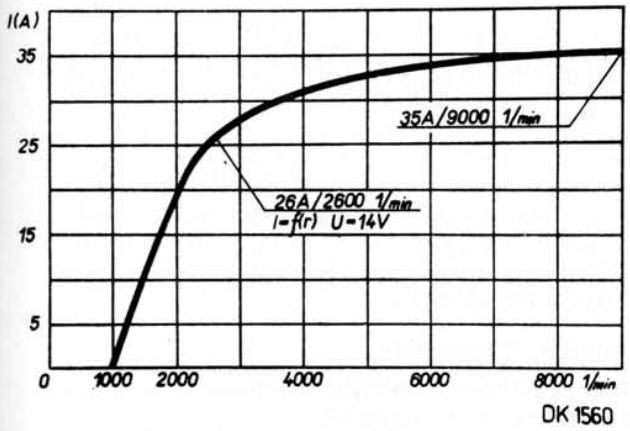


Fig. 13.3/1 - Alternator 443.113-516.021 Output Curve

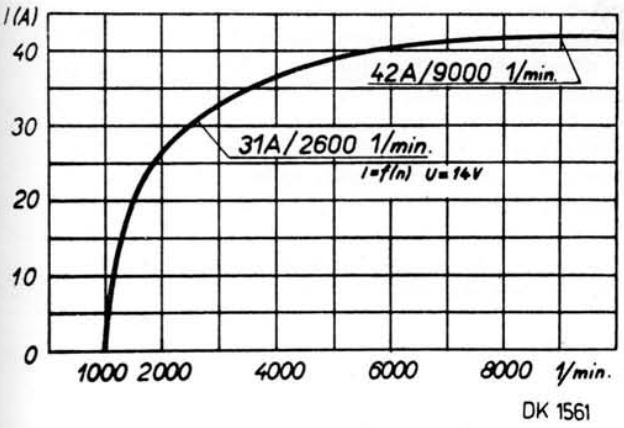
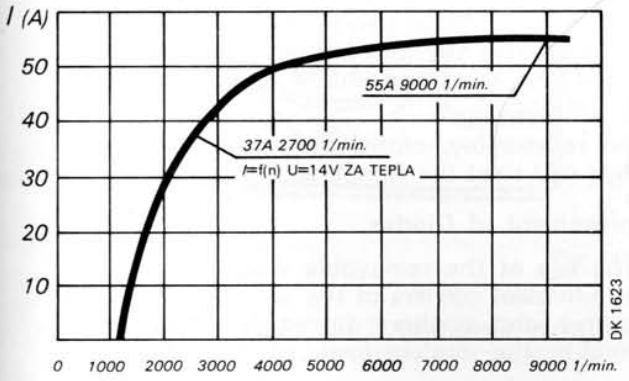


Fig. 13.3/2 - Alternator 443.113-516.121 Output Curve

Performance Diagram of Type 443.113-516.181 Alternator



Alternator operates in conjunction with PAL-MAGNETON alternator regulator 443.116-417.020 443.116-419.071

a) An incorrect pole connection to the wiring or an incorrect pole connection to the battery destructs invariably the alternator semiconductor device.

b) Do not short-circuit alternator or regulator terminals even for the briefest moment (for example, when trying inexpertly to check the alternator operation) as it involves the risk of destroying the semiconductors.

c) Disconnect the battery when replacing some component of the charging circuit to eliminate the possibility of accidental short--circuits over the alternator or voltage regulator relay terminals, which are apt to result also in the destruction of semiconductors (point b).

d) Do not disconnect the battery while the engine is running.

e) Do not start the alternator at no-load, i. e., with the lead disconnected from the terminal "+B" and with the connected terminal "M". At increasing speed, this no-load condition will cause an exceptional rise of the alternator voltage, which again will destroy the semiconductors.

f) When using arc welding for repairs on the car, it is recommended to disconnect all leads from the alternator. Protect the lead "+B" against a short-circuit.

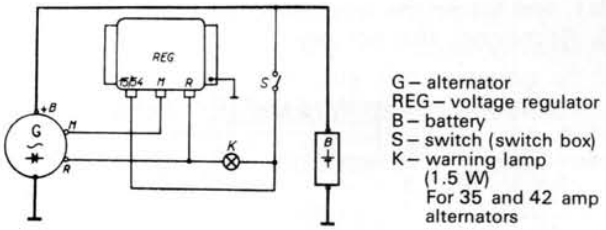


Fig. 13.3/3A – Basic Wiring for Alternator Operation – see also wiring diagram in Fig. 13.4/1

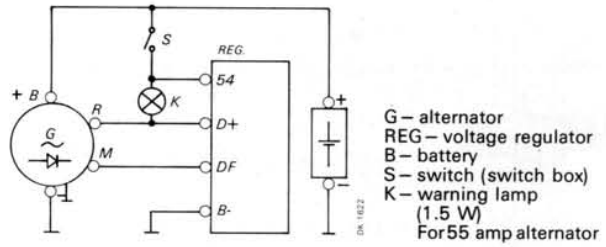


Fig. 13.3/3A – Basic Wiring for Alternator Operation – see also wiring diagram in Fig. 13.4/1

g) Excitation of the alternator by a current supply outside the car is not permitted. Again the semiconductors would suffer.

h) A blown charging warning lamp must be replaced immediately with a new one. Otherwise correct excitation of the alternator is not ensured. Use a new lamp of the same rating (or input), i.e., 1.5 to 2 W.

i) Be sure that there is a perfect electrical connection on the connecting terminals and that the alternator and regulator are properly earthed.

j) The alternator is aerated, open. Therefore take care when washing the car that water or cleaning agents do not get into it through the venting holes.

Removing the Alternator

1. Disconnect the battery.
2. Disconnect the alternator leads. It will be helpful to remember the colour of one conductor and its connection for reinstallation.
3. Remove all parts holding the alternator on the engine, and lift away the alternator.

Reinstalling the Alternator

1. Clean all mounting surfaces. For the alternator mounting, see Chapter 2.3, par. 42.
2. With the battery disconnected, insert the conductors into the respective connectors "M" and "R" (the conductors bear the same symbols), and fasten the remaining lead with a nut.
3. Reconnect the battery.

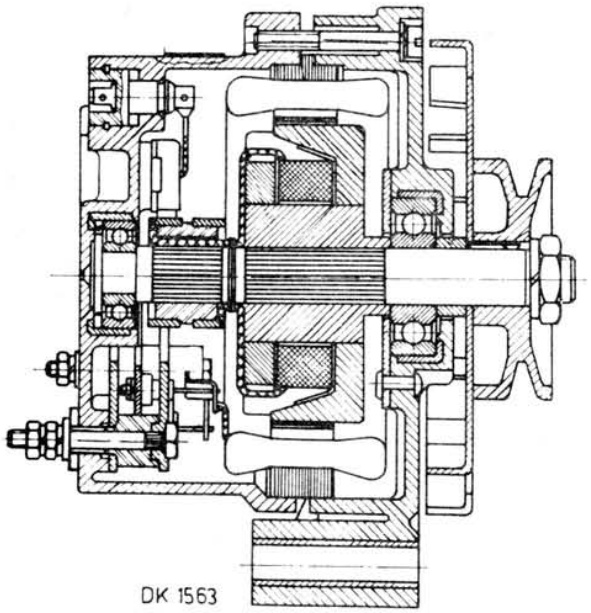


Fig. 13.3/4 - Alternator - Sectional View

Alternator Disassembly - Repairs

1. Screw off the belt pulley nut and remove the belt pulley and fan.
2. Lift the brushes with a hook proceeding through the holes in the commutator end shield and hold them in the lifted position by wires inserted into the shield through dia. 3 mm holes under the terminals "M" and "R".
3. Mark the mutual (relative) position of the commutator and drive end shields and separate the alternator after having removed its clamping bolts. The drive end shield remains connected with the stator.

This disassembly will give access to the brushes and some of the diodes. All other jobs, with the exception of the renewal of the bearing, should be done by experts in specialized repair shops - see the note supplementing the following paragraphs.

Alternator Reassembly

1. Insert the circlip into the bearing bore in the commutator end shield.
2. Fit the drive end shield with bearing on the rotor shaft.
3. Assemble the stator with the rotor and the commutator end shield.
4. Tighten the alternator with clamping bolts and check the rotor for free rotation while tightening the bolts.
5. Slip the spacer on to the shaft, tap the key in position, fit the fan and belt pulley, and tighten the entire assembly using the nut with spring washer.
6. Pull out wires from the commutator end shield which have been used to hold brushes in their lifted position.

Replacement of Bearings

The used bearings are fully closed and sealed, and they have been filled in the factory with lubricant to last through their entire service life.

1. Pull the bearing off the rotor using a suitable puller. When refitting the bearing, press it on to bear on the shaft collar.
2. Before removing the drive end shield bearing, first drill off the heads of the flange rivets and then drive the bearing out from the outer side of the drive end shield using a suitable mandrel (drift).

On reassembly, close the bearing with the flange and rivet the flange to the shield.

Replacement of Diodes

The use of the removable diode block with the individual carriers of the so-called positive, negative, and auxiliary diodes, facilitates considerably the replacement of any defective

diode. The diode block proves especially useful for the exchange repair system.

The only objective diode measuring method is the measuring of their volt-ampere characteristic or the use of a special instrument. Readings of the currently used measuring instruments (ohmmeter, megger) can be used only for information.

Note:

Elaborate diagnostic methods or repairs, especially of the rectifier, should be left to specialized repair shops which have the required equipment and skilled mechanics.

Informative Checking of Alternator in Car

The described check can be used only for information purposes. Only a check of the output with variable load on a test bench can be considered accurate and binding - see curves in Figs. 13.3/1 and 13.3/2.

Conditions of a correct alternator operation are undamaged wiring, perfect electric connections on alternator, voltage regulator, and battery terminals, and an adequate pull (correct tensioning) of the alternator drive belt.

A defect of the alternator or regulator is signalled by the charging warning lamp (the battery is not charged).

Procedure for Diagnosing an Alternator - Regulator Defect

Prepare an auxiliary conductor with connectors to bridge over the alternator terminals according to the diagram in Fig. 13.3/5.

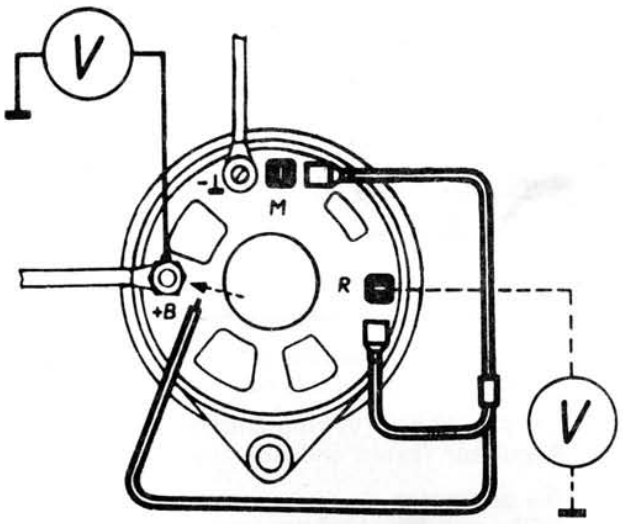


Fig. 13.3/5 - Checking Alternator Wiring in Car - Using an Auxiliary Conductor

1. Disconnect leads from the alternator terminals "R" and "M". (Terminal "R" has a red insulator, terminal "M" a black one - do not mix them up). Terminal "+B" remains connected to the battery.

2. Interconnect terminals "M" and "R" with the auxiliary conductor and connect a voltmeter between the terminal "+B" and the alternator frame (−).

3. Start the engine but do not let its speed rise above idling speed.

4. Excite the alternator - apply the ends of the auxiliary conductor, connected to the terminals "R" and "M", for two to three seconds to the terminal "+B". If the alternator cannot be excited, it is defective beyond any doubt.

5. Increase gradually the engine speed. If the reading of the voltmeter rises with the speed rising above the idling r.p.m., the alternator is probably in good condition. During this test, the engine speed must not be increased so that the voltage exceeds 20 volts (peak value). It is recommended to conduct the test within the range up to 15 volts.

6. Check the voltage difference on the alternator terminals "+B" and "R". This difference must not be larger than 0.4 volts.

If the alternator has satisfied the described tests, it is in order, and the defect has to be sought in the voltage regulator. The cause of the defect can be merely a poor contact between the alternator frame, the voltage regulator frame, and the car structure, or poor battery earthing.

Note: A defect of the alternator or regulator relay can cause not only non-charging of the battery but also the battery overcharging.

At a routine service check of the entire power supply set, when a defect is not suspected, it is sufficient to check the regulated voltage or the reaction of the charging warning lamp or ammeter to the rising speed.

With the voltmeter connected to the terminal "+B", the regulated voltage must vary within about 14±0.8 volts in the range of higher and medium engine speed. The charging warning lamp must go out already at idling speed or at a slightly higher speed.

As has been already mentioned, a failure of the alternator or voltage regulator is signalled by the warning lamp in the first place. This lamp reacts namely to almost any failure in a certain manner.

13.4 VOLTAGE REGULATOR

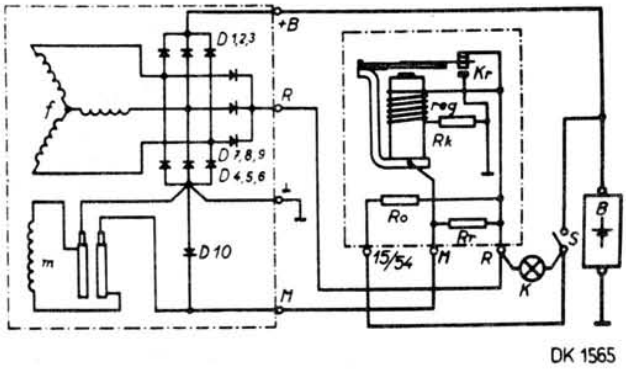
The voltage regulator used is of the PAL-Magneton make, model 443.116-417.020.

It is essentially a vibrator operating in con-

junction with the alternator according to Chapter 13.3 and maintaining a constant voltage of the power supply set within the entire range of service speeds.

The voltage regulator is installed on the body cross bearer, to the right of the engine and beside the ignition coil.

To facilitate handling of its leads, especially the access to their connections, it is recommended to remove the regulator fastening screws. For disconnecting procedures, see Chapter 13.3 "Alternator Installation and General Instructions".



DK 1565

Fig. 13.4/1 - Internal Wiring Diagram of Alternator with Voltage Regulator and Outer Connections

Alternator:

B, R, M - alternator outlets
f - alternator phase windings
m - alternator field winding
D1, 2, 3, 4, 5, 6 - main diodes
D7, 8, 9 - alternator auxiliary diodes
D10 - alternator choking diode

Voltage regulator:

R, M, 15/54 - regulator outlets
reg - regulator tension winding
Rk - balancing resistor
Ro - protective resistor
Rr - adjustable resistor
Kr - regulator contacts

Outer connections:

K - warning lamp (1.5 W)
S - switch (switch box)
B - battery

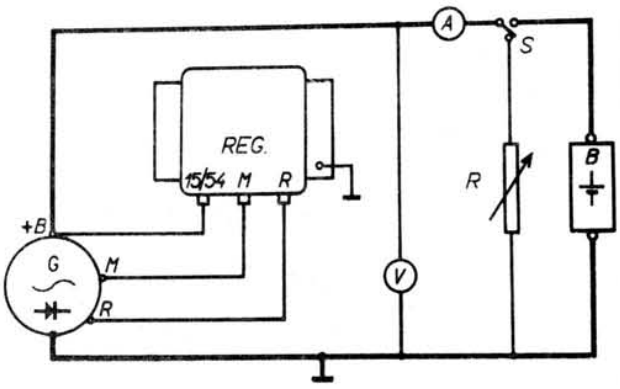
Checking Voltage Regulator on Car

The regulator operation can be affected by loosened connections and an imperfect earthing. If the warning lamp does not go out when driving, i.e., if it glows at increased engine speed brightly or dimly, or if it does not start glowing after stopping the engine and a new turning of the ignition key in the switch box, the voltage regulator is probably faulty. Another symptom of a regulator failure is a poor charging of the battery or its overcharging. If there is nothing wrong with the regulator, check the regulated voltage over the regulator which should read 13.2 volts at the minimum and 14.8 volts at the maximum. This check in the car is only tentative and only a check on the test bench can be considered as definite and binding.

Electrical Adjustment

The voltage regulator should be tested and adjusted only on a test bench in a connection shown in Fig. 13.4/2.

At a load of some 2 amperes, the checked voltage should correspond to values specified in the column "Checking". If the checked voltage is within the specified range, do not adjust the regulator. Otherwise adjust it to the values specified in the column "Adjustment". If water evaporates abnormally from the battery, adjust the voltage regulator to the basic values of "Adjustment" utilizing the lower section of the tolerance zone.



DK 1566

Fig. 13.4/2 - Wiring Diagram of Voltage Regulator Tested and Adjusted on a Test Bench

G - alternator
REG - voltage regulator
A - ammeter
V - voltmeter
S - switch
R - load resistor
B - battery

443.116 - 417.020 Mechanical Regulator

Regulating step	Checking	Adjustment
Step I	13.2 V minimum	13.6 V minimum
Step II	14.8 V maximum	14.0 V maximum

443.116-419.071 Semiconductor Regulator.

Regulation Step	Checking	Adjustment
Step I	13 V Min	13.5 V Min
Step II	14.5 V Max	13.9 V Max

Start up the alternator from rest with a fully charged battery. After its excitation (at about 1,000 r. p. m.), disconnect the battery and connect the load resistor. The alternator must be restarted from rest at each repeated measuring (cold). The value of the regulated voltage can be adjusted by bending the hanger of the regulating spring on the regulator yoke.

Voltage Regulator Maintenance

The regulator does not require any maintenance during its operation. It is only necessary to pay attention to its proper earthing and a perfect electrical contact on the terminals.

Note: For a detailed diagnosis or repairs, address yourself to specialized repair shops where special equipment is at the disposal of skilled mechanics.

13.5 DISTRIBUTOR

The distributor comprises a breaker of the primary circuit with a capacitor, and the distributor proper of the high-tension circuit to sparking plugs with an automatic speed governor and a vacuum timing control unit. For ignition harness, see Chapter 13.1 - Connection of Free Conductors, and Chapter 2.3, par. 18.

ŠKODA 105 S and 105 L distributors:
type PAL-Magneton, model 443.213 - 204.480

ŠKODA 120 L and 120 LS distributors:
type PAL-Magneton, model 443.213 - 204.460

There are certain differences in the course of the speed control characteristic. Otherwise, their specifications are the same:

Distributor maximum speed	3,000 r. p. m.
Direction of rotation	clockwise
Lift of contacts (contact point gap)	0.4 ± 0.05 mm
Pressure of closed contacts	5 to 6 N (0.5 to 0.6 kg)
Capacitor	0.2 to 0.25 microfarads
Contact angle of contact points (up to 3,000 r. p. m.)	55% ± 5%

Maintenance, Adjustment of Contact Breaker Point Gap and Ignition Advance

See Chapter 15.3.

Distributor Removing and Refitting

After having slipped off cable shoes from the sparking plugs, the cable of the ignition coil, and after disconnecting the feed cable, remove the carburettor connecting hose. Remove the

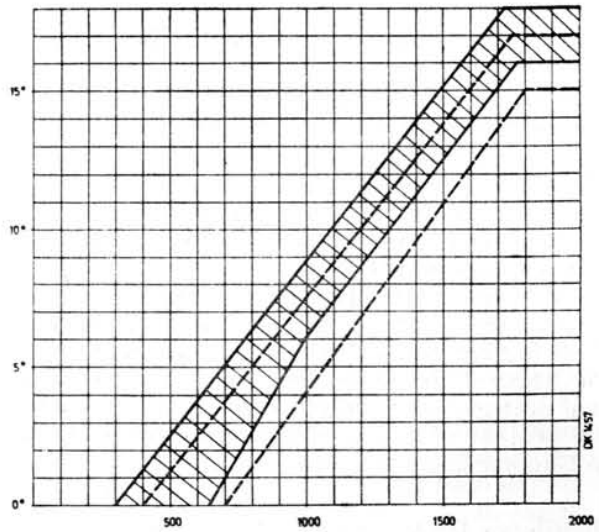


Fig. 13.5/1 - Course of Distributor

443.213 - 204.480 Speed Control Characteristic. A new distributor can operate within the zone identified by dashed lines.

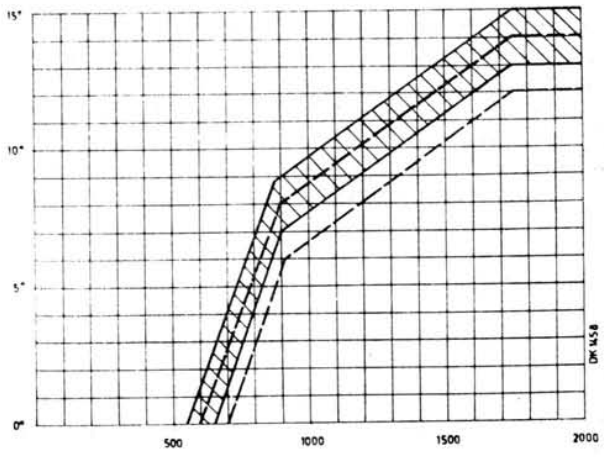


Fig. 13.5/2 - Course of Distributor

443.213 - 204.460 Speed Control Characteristic. A new distributor can operate within the zone identified by dashed lines.

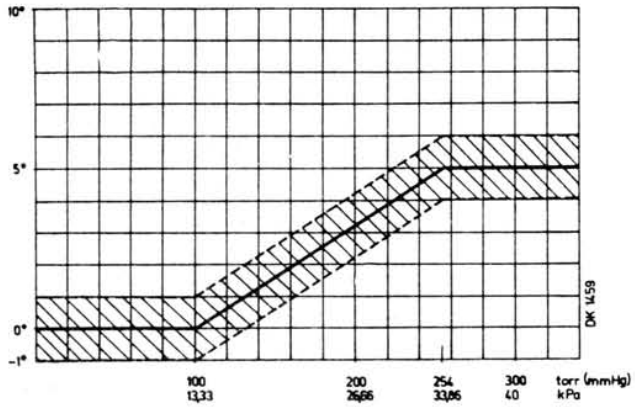


Fig. 13.5/3 - Vacuum Control Course – applicable to both regulator models

capscrew fastening the distributor bracket to the support on the engine (do not loosen the bracket clamping bolt).

Refit the distributor on the engine by reversing this procedure. The coupling on the shaft is asymmetrical and it has to engage into the head of the drive shaft in the engine. To seat properly a new distributor or a distributor, the bracket of which has been loosened, refer to Chapter 2.3, par. 25 to 27.

Distributor Disassembly and Reassembly

This should be done in specialized workshops, especially with regard to the checking of the mechanical condition or a repair of the distributor. It is recommended to use a suitable holder for doing the majority of the required jobs in a vertical position. When reassembling the distributor, lubricate the sliding points according to Chapter 15.3 but beware of overlubrication.

Remove also the capscrew on the bottom of the distributor housing and drip some low-pour point oil into the hole to increase the oil reserve of the shaft sel-lubricating bearing - see Chapter 15.2 "Special Oils".

Disassembly

1. Remove the distributor cap and the breaker arm.

2. Remove the coupling from the shaft (note the relative position of the eccentric dogs and the breaker arm).

3. Remove the circlip from the pivot and lift away the breaker arm.

4. Remove the subassembly of the terminal "1" (current supply to distributor).

5. Screw off the capacitor.

6. Screw off the retaining springs.

7. Lift away the vacuum chamber (do not open it, a change of the curve is an improbable defect; do not change the screw-in depth of the pull-rod).

8. Lift away the contact breaker base plate with packing piece from the housing.

9. Lift away the shaft with the centrifugal governor.

10. If necessary, disassemble further the subassembly of the shaft with the centrifugal governor (advance mechanism) and cam.

Reassembly

1. Reassemble the centrifugal governor (the weights must be free to rotate on the pins).

2. Install the reassembled shaft with the respective washers into the distributor housing.

3. Fit the contact breaker base plate with the fixed contact holder and packing piece into the housing.

4. Fit the pull-rod on the pin and lock it in position, screw down the vacuum chamber with the capacitor. Check the ignition advance position for the first cylinder.

5. Screw down the retaining springs with shims (the spring with the dog opposite to the terminal "1"); the base plate must rotate freely in the distributor housing.

6. Reasemble the terminal "1".

7. Fit the breaker arm on the pivot and lock it in position. Adjust the contact breaker point gap (lift) and check the contact pressure.

8. Slip washers on the shaft in the original sequence, slip on the coupling and lock it in position.

9. Fit the lubricating felt into the hole of the cam and install the breaker arm.

10. Fit the distributor cap in position.

11. Check the distributor operation.

Checking

A definite indication of the condition of the distributor (during an operational check as well as after a repair) can be obtained by testing the distributor on a test stand with a circular spark gap. After a preliminary adjustment of the contact breaker point gap, the stand is used for checking:

1. The contact point contact angle.

2. The spark angular distribution (with a tolerance of ± 45 angle minutes within the entire operational range).

3. The range and course of the centrifugal and vacuum control.

4. The operation at maximum speed (length of spark on spark gap - 4 mm) for a brief period (about 2 minutes).

13.6 IGNITION COIL

It is installed in the right-hand part of the engine compartment beside the alternator voltage regulator and used for transforming the interrupted primary current into the high tension required for the spark discharge on sparking plugs.

To remove it, disconnect the leads and screw off the fastening nuts. When reinstalling the ignition coil, do not omit to put spring washers under the fastening nuts.

Maintenance and Checking

The ignition coil can operate properly only if the cap is clean and dry so that no discharges can occur on the cap surface. Defects originating inside the coil cannot be removed (puncture, break).

You can check the ignition coil function tentatively by disconnecting the high-tension cable of the distributor coil centre outlet and holding its end about 10 mm from the car structure. Then switch on the ignition and crank the engine using the starter motor. If sparks flash over from the cable end to the car structure, the ignition coil is in order (but only on the condition that the primary circuit is also in order).

However, only a test on a test bench can give correct information on the actual condition of the ignition coil.

It is recommended to test it at its working temperature because some failures do not manifest themselves while the coil is cold.

13.7 SPARKING PLUGS AND IGNITION CABLES

N.T.A. APPROVED PLUGS

Spark Plugs

Pal	14-8 14-7Y N7Y 148Y N8Y	105 105 105	120 L 120 L 120 L	120 LS 120 LS 120 LS
Bosch	W200T35 W5BC	105	120 L	120 LS
Champion	L87Y	105	120 L	120 LS
NGK	BP6HS BP7HS	105	120 L	120 LS
KLG	7055 7555	105	120 L	120 LS

Minimum	13.4V
Maximum	14.3V

For the ignition harness, see Chapter 2.3, par. 48.

Remove ignition cables from sparking plugs by pulling at the cable sockets, never at the cables themselves. Keep the sparking plugs and ignition cables clean, free of dust and oil.

Adjust the gap between the sparking plug electrodes by bending the outer electrode. The correct gap should be 0.7 mm. Clean the electrodes with the finest-grain emery paper. Heavy deposits can be first scraped off but take care not to leave deep scratches.

13.8 LIGHTING

The following paragraphs contain general information and instructions for adjustment and installation. The types of used bulbs, their removal and installation, are subjects of the next separate Chapter.

a) HEADLAMPS AND LIGHTS

Main and Auxiliary Headlamps - Adjustment

The main headlamps are installed so that they illuminate the roadway without, however, dazzling the oncoming drivers when driving with dipped lights. The difference of the directions of the low and the high beam is given by the construction of the bulb; therefore, the decisive factor for the adjustment of the headlamps is the direction of the low beam.

Auxiliary Headlamps are adjusted so that the beams are parallel with the ground and in line with the car centre line.

If you have no special adjusting apparatus available, a checking wall shown in Fig. 13.8/1 will do. When using it, proceed as follows:

Drive the car 5 metres from the perfectly vertical wall so that its nose is aligned with it. Measure the height of the headlamp centres above the ground (measure "C"), subtract from it the measure specified in the legend of the illustration, and draw a line on the wall at this height, parallel with the ground. Then check and/or adjust the symmetry of the high beams (points "A", "B"). Adjust the borderline between light and darkness at dipped lights so that it is slightly below the drawn line or, at the most, coincides with it. The right-hand part of this borderline deviates upward from the centre of the light (by about 15 deg.) as shown in the illustration. Adjust each headlamp sep-

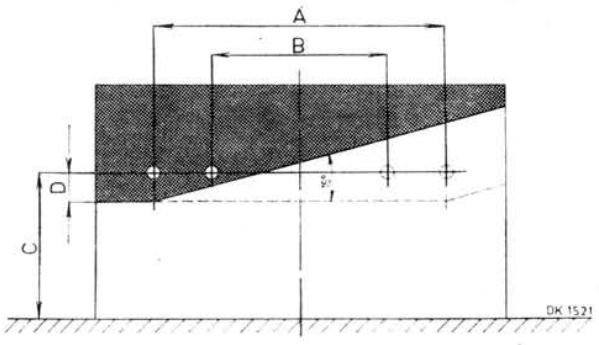


Fig. 13.8/1 - Headlamp Adjusting Wall - for right-hand traffic and 5 metre distance

A - centre projections of main headlamps
B - centre projections of auxiliary headlamps
C - height of headlamp centres above ground
D - 60 mm - downward deviation of low beam

arately (screen the other one). With left directional headlamps, the borderline deviates towards the other side.

If the headlamps are nearer to the wall than the said 5 metres, decrease the measure indicating the deviation of the light and darkness borderline from the height of the headlamps above the ground in the direct proportion to the decrease of the distance, for example when placing the car 2.5 metres from the wall, decrease the deviation by half.

Light projections "A" and "B" correspond to the spacing of headlamps on the car and they have the following dimensions:

Headlamps, dia. 160 mm	1,030 mm
Dual headlamps, dia. 130 mm . .	1,114 mm
Auxiliary headlamps, dia. 130 mm .	790 mm

When adjusting the headlamps, the car must be empty and the tyres must be correctly inflated. Halogen headlamps should not be left switched on for too long a period as they build up heat if not cooled by head-on air blast when driving.

For the adjustment of headlamps are intended screws in their frames. The screws are accessible after the removal of the side parts of the grille. Remove the capscrews at the corners and push the grille aside.

Headlamp Assembly

a) The fundamental fastening part of circular headlamps is the so-called support plate (rectangular plate) attached to the bodywork by capscrews with lock washers. The headlamp housing is bolted to this support plate by bolts with nuts and lock washers. One of the bolts holds down also the lug of the earthing cable. The inner frame, forming the adjusting element of the headlamp insert, is attached to the housing by two special adjusting screws and two tension springs. The headlamp insert is attached to the bezel by three capscrews.

There is one left-hand and one right-hand support plate. Both should be mounted with the arrow and the word "TOP" upwards. With the exception of the auxiliary headlamps, the headlamp inserts are different for the left-hand and the right-hand traffic. The leads enter the housing through a rubber grommet.

When replacing the insert, remove the bezel capscrews. After having fitted a new insert, it is necessary to readjust the headlamps.

Front Direction Indicators

The right-hand and left-hand direction indicators are undisassemblable units (the lamp fastening sockets (locks) are mounted in the direction towards the car longitudinal centre line). They are fastened to their brackets in the bumper with a nut and a plain and a lock washer.

Tail Lamp Cluster

The lamp cluster is an undisassemblable unit fastened to the bodywork by nuts with plain washers and the respective bolts. Scrape off the enamel at the top bolt used for holding down the earthing cable.

For the sequence of the individual lamps and their bulbs see Fig. 13.1/1 and the respective paragraph on bulbs.

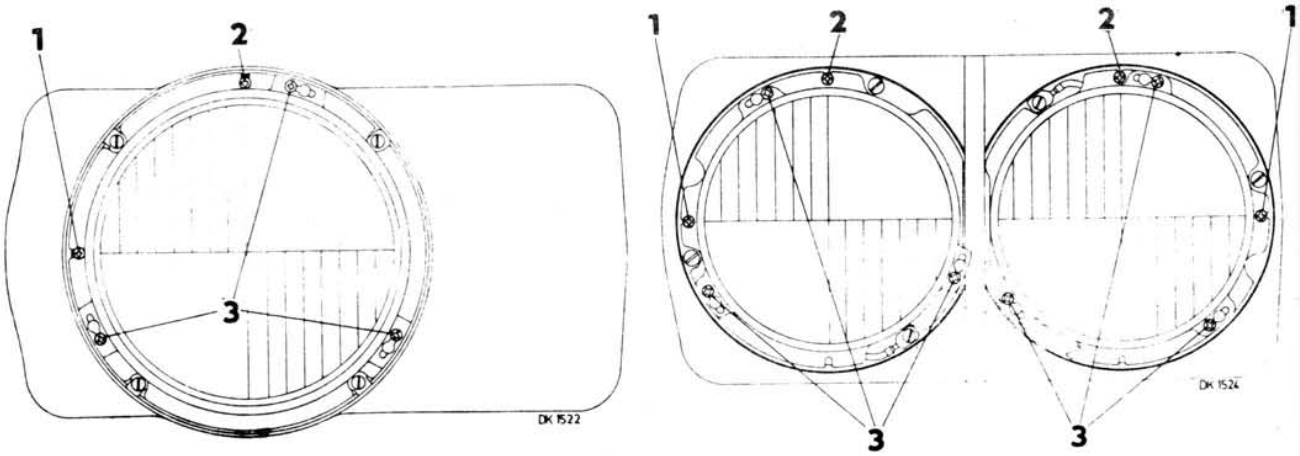


Fig. 13.8/2 - Adjusting and Fastening Screws of Right-hand Headlamps - their location on left-hand headlamps is their mirror reflection

1 - Sideways adjusting screw
2 - Height adjusting screw
3 - Fastening screws

Dome (Courtesy) Light

The dome light, forming an undisassemblable unit, is pressed firmly into the respective aperture in the bodywork. Its edge, which will be in contact with the side flat earthing spring, must be free of paint. The lamp can be removed by careful prising out with a screwdriver or a similar tool applied behind the end of the cover marked with an arrow, i. e., on the end opposite to the switch. When reinstalling it, insert into the aperture first the end with the switch and then press in the other end.

Connect the positive (red) lead to the knife connector at the flat side spring and the lead from the door switch (green) to the centre knife. Do not connect the knife opposite to the switch. It is a live negative pole!

Licence Plate Light

This lamp is an undisassemblable unit fastened by bolts with nuts and lock washers over a rubber seal. The earthing cable is attached to one of the bolts. Remove the paint at this point.

Instrument Illumination

In the majority of cases, this illumination is an integral part of the instrument design. There is a limited access to the lamps and the possibility of replacement is also limited - for details see Chapter 13.15.

Warning Lamps

Here the above information is applicable. The warning lamp of the auxiliary headlamps is formed by the switch push button.

b) TYPES OF BULBS AND THEIR REPLACEMENT

With the exception of headlamp bulbs which are held down by locks over their sockets, and the dome light bulbs inserted by the tips of their bases into contact holders, all bulbs are held down by the so-called bayonet locks. When replacing these bulbs, simply depress and turn them.

Do not touch the bulb of the halogen lamp with naked fingers. If you have touched it inadvertently, wash it with alcohol.

Headlamps - Remove the outer parts of the radiator cover as described in the paragraph on headlamp adjustment. Loosen the headlamp fastening screws, rotate slightly the headlamps and remove them over the heads of these screws.

Then slip off the terminal board or cables (depending on the headlamp design), remove the seal of the lock, if any, lift away the bulb lock after having depressed and turned it anticlockwise, and remove the bulb. Withdraw the bulb of the clearance (side) light together with its socket.

Fit new bulbs in reverse order. Insert main bulbs along the locking bosses of their sockets. If the side light bulb has no earthing cable, use the lip of the main bulb lock to retain it. Fit the seal of the lock properly so that water cannot get into the headlamp.

Front direction indicators, tail lamp cluster, licence plate light - rotate the lock to release it from the lamp cluster back plate and lift it away together with the bulb.

The individual lamps are arranged in the cluster from top to the bottom in the following sequence: tail light, stop light, direction indicator, reversing lamp.

Dome (courtesy) light - withdraw the bulb after having removed the lamp cover (see the preceding information concerning dome light removal).

Warning lamps and instrument panel illuminating lamps - access to the bulbs and their handling is described in Chapter 13.15.

Used Bulbs

Headlamps:

- asymmetric, twin-filament[1]	12 V/45/40 W	- base P 45t
- halogen, twin-filament[2]	12 V/60/55 W H4	- base P 43t - 38
- halogen, single-filament[3]	12 V/55 W H1	- base P 14.5s
Side lights, parking lights	12 V/4 W T 8/4	- base BA 9s
Direction indicators (front and rear)	12 V/21 W P 25-1	- base BA 15s
Tail lights	12 V/5 W R 19/5	- base BA 15s
Stop lights	12 V/21 W P 25-1	- base BA 15s
Reversing lamps	12 V/21 W P 25-1	- base BA 15s
Licence plate light	12 V/5 W R 19/5	- base BA 15s
Dome lamps, soffit type	12 V/5 W C 11	- base S 8.5
Warning lamps	12 V/2 W	- base BA 9s
Instrument illumination lamps	12 V/2 W blue	- base BA 9s

[1]) ŠKODA 105 S - special equipment, see [2])
[2]) ŠKODA 105 L, 120 L, 120 LS
[3]) ŠKODA 120 LS auxiliary headlamps

13.9 HORN

It is situated behind the left-hand part of the front bumper. To remove it, disconnect the leads and remove the fastening screw.

Operating voltage	12 volts
Maximum current demand . . .	4 amperes

Horn Adjustment

Before adjusting (tuning) the horn, clamp it firmly by the bracket and tighten thoroughly all screws "4" joining the horn cover with the housing and the diaphragm.

1. The horn is "hoarse" - Using a screwdriver rotate slowly the screw "1" clockwise to adjust the current demand till the tone is clear.

2. The horn sounds weakly - Using a screwdriver, rotate the screw "1" slowly anticlockwise to decrease the current demand till the tone is loud and clear.

3. The horn does not sound at all - Proceeding through the aperture in the front cover, loosen the nut "2" using a socket spanner. Then insert a screwdriver and rotate the adjusting screw clockwise till it bears lightly on the core. Then back off the screw by $^1/_2$ or maximally $^3/_4$ of a turn to adjust the distance of the armature from the core. Hold the screw in this position with the screwdriver and tighten firmly the nut by rotating it clockwise. After having connected the battery (of the specified voltage), you will hear the armature being attracted (a clear and loud click). Now continue to switch the battery on and off while rotating carefully and slowly the screw "1" anticlockwise till the horn sounds. Tune it by rotating the adjusting screw slightly clockwise or back. After having adjusted (tuned) the horn, secure all adjusting parts with a dab of paint.

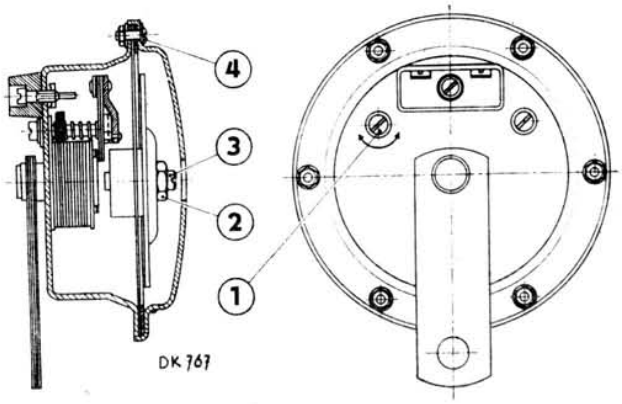


Fig. 13.9/1 - Sectional View of Horn and a View of Rear Adjusting Screw

13.10 STARTER MOTOR

This is a series motor for intermittent operation with an electromagnetically engaged pinion.

Specifications

Type	PAL-Magneton 12 V/0.8 h. p. - 443.115-142.070
Rated output	0.66 kW (0.9 h. p.)
Starting torque	12.25 Nm (1.25 kgm)
Speed for rated output	1,000 r. p. m. maximum
Voltage across terminal "30" at rated output .	9.5 V maximum
No-load starting current	65 A maximum
Direction of rotation	anticlockwise (left-hand)
Number of pinion teeth/modulus	9/2.5
Contact spring pressure	9.3 N (0.950 kg) $\pm 10\,\%$

Maintenance

The maintenance consists of periodical inspections and repairs or replacement of faulty parts:

a) brushes
b) brush springs
c) commutator
d) starter pinion and idler
e) self-lubricating bearings

The brushes must be sufficiently long and they must slide freely in their cells, their pressure springs must have a sufficient thrust, the commutator must not show any damage, and it must be free of dust and dirt. Clean the commutator with alcohol, petrol or trichloroethylene, and let it dry before closing it and switching on the starter motor. A burnt or mechanically damaged commutator must be repaired or replaced immediately. A commutator in good condition has a brownish red hue.

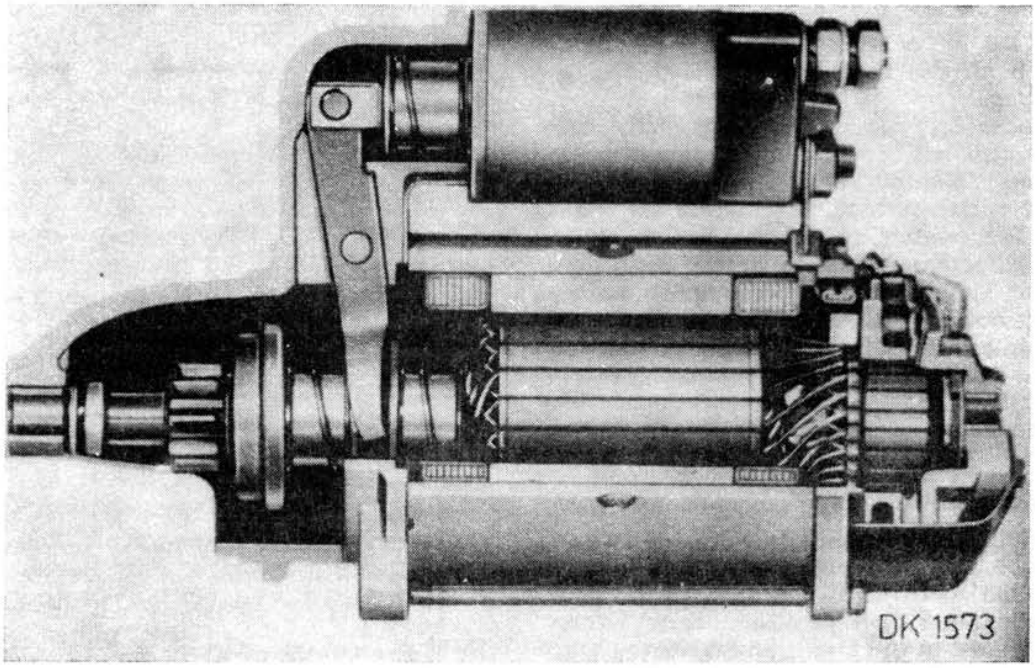


Fig. 13.10/1 - Sectional View of Starter Motor

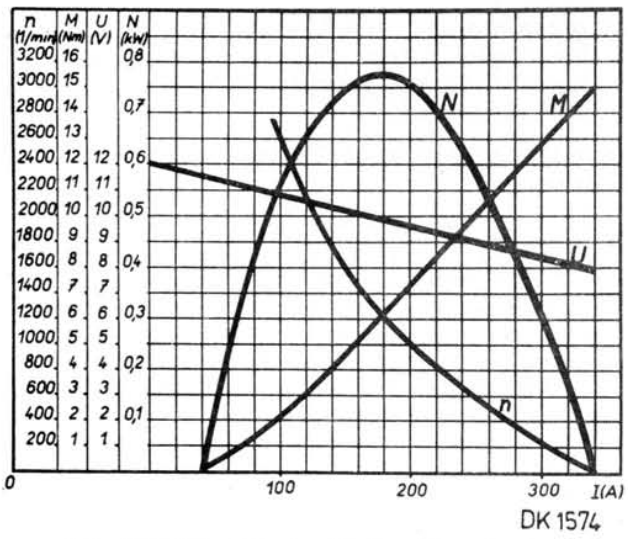


Fig. 13.10/2 - Starter Motor Electrical and Output Curve

Replace the damaged pinion (with damaged teeth) with a new one complete with the idler. For self-lubricating bearings, see the note to the paragraph dealing with the disassembly of the starter motor.

Starter Motor Removal and Refitting

The starter motor is installed under the floor of the rear (in-built), luggage compartment on the righ-hand side of the gearbox. Tip the rear seat cushion, lift the mat, and remove both covers in the luggage compartment floor board. Disconnect the battery (the eathing strip terminal).

Disconnect the lead to the switch and the lead from the battery from the starter motor. Remove capscrews fastening the starter motor to the gearbox housing and lift it away. Reverse this procedure when refitting the starter motor.

Starter Motor Dissassembly

1. Remove the commutator end shield cover and the clamping bolts. Lift the brushes in the shield holders.
2. Lift away the commutator end shield together with the washers of the brake (keep in mind the sequence and the manner of fitting of the washers).
3. Remove the stator (it cannot be taken apart).
4. Remove capscrews holding the switch on the drive end shield, free the switch armature from the fork suspension, and withdraw the switch.
5. Remove the lock washer of the pre-engaging lever pin and drive the pin out of the drive end shield.
6. Remove the armature with the pinion from the drive end shield.
7. Slip off washers of the shaft drive part (keep in mind their sequence).

Strike the slip-over ring off the circlip (towards the motor winding). Open the circlip and pull it off the shaft together with the released parts.

8. If necessary, re-turn the commutator and scrape or mill out the insulation between the laminations. "Mikanit" should be 0.4 to 0.8 mm below the active surface.

Note: The switch cannot be further taken apart. If defective, it has to be replaced with a new one. When cleaning parts of the starter motor, do not dip the armature or the pinion with the idler into petrol or another degreasing agent. The same applies to the end shields with bearings. By dipping them in a degreasing agent, the bearings become practically worthless.

Starter Motor Reassembly

1. Lubricate the helix of the armature shaft with grease - see Chapter 15.2 "Lubricants of foreing make" and fit the pinion with the idler and the slip-over ring in position. Fit the circlip into the groove in the shaft, and drive the slip-on ring over it. The pinion with the idler must move freely along the shaft.

2. Slip the respective washers on the shaft in their original sequence (carrier ring, distance ring, fibre ring, distance ring) and insert the armature with the engaging lever into the drive end shield.

3. Suspend the switch armature into the pre-engaging lever and bolt down the switch lightly. Fit the lever pin into the drive end shield and lock it in position with the retainer.

4. Tighten the capscrews of the switch and fit the stator on the drive end shield.

5. Install the respective washers into the commutator end shield in their original sequence (the dished washer with its centre facing the shield, then the plain washer, the toothed washer, and the drive washer).

6. Fit the commutator end shield with lifted brushes on the shaft (in the position according to the recess for the excitation outlet and the notch) and screw in the clamping bolts.

7. Install the brush interconnecting strip and bolt it down together with the field winding outlets to the positive brush holders, lower the brushes.

8. Fit the insulating strip in position and bolt down the cover.

9. Test the starter motor.

Diagnosing Starter Motor Defects in Car

a) If the starter motor refuses to operate, look first for an interrupted connection between the battery and the starter motor, the engine earthing and the starter motor, or the engine earthing and the battery. If these connections are in order (current flows to the terminals "30" and "50" with switched on ignition), start looking for a failure of the starter motor switch. Even in this instance, the cause can be a fully discharged or faulty battery.

b) If the starter motor continues running even after the ignition key has been switched in the switch box from the position "START", it has to be stopped without any delay by disconnecting the battery (using its earthed pole).

c) If the starter motor has no power to crank the engine, start with switched-on headlights. A marked dimming indicates a poorly charged battery.

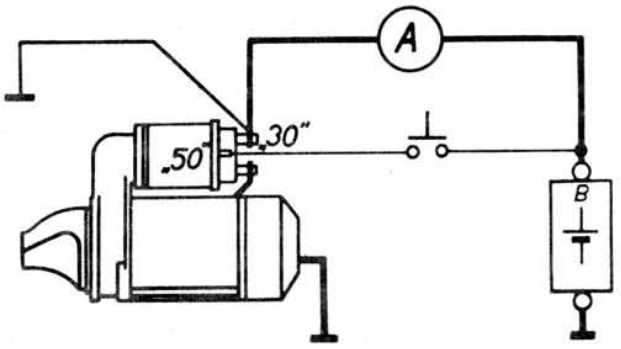


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Fig. 13.10/3 - Starter Motor Testing Connection

Tentative Checking of Starter Motor Outside Car

Connect the terminal "30" of the starter motor to a properly charged battery and incorporate an ammeter with a wide measuring range into the circuit - see Fig. 13.10/3. Start the engine (feed current to the terminal "50"). The value of the current at idling speed must not exceed 65 amperes (not considering the peak at the first momentous deflection).

The starter motor must run noiselessly, smoothly, and the pinion must move smoothly into and out of the rest position (engage and diesengage). The engaged pinion must not rotate direct on the face of the slip-on ring. The run-out of the starter motor must not last longer than 8 seconds after the disconnection of the switch from the current supply.

Inspect the brush pressure springs. The brushes must bear on the commutator by at least two thirds of their surface and they must move freely in their cells.

The armature should have a noticeable axial clearance (play) not exceeding 0.7 mm. At a slight rotation of the pinion in the direction of the starter motor rotation, the idler must slip freely.

An experienced worker should be able to judge the condition of the starter motor while testing it at no-load run. But only a test on the test bench can give absolutely objective results.

13.10 STARTER MOTOR

A) Unreliable starter motor operation, lack of power

1. Insufficiently charged battery	Charge battery
2. Corroded, soiled or loose connections in leads (connection resistances)	Clean, tighten fast
3. Faulty battery (usually gradual deterioration)	Remove battery defect
4. Starter motor carbon brushes faulty (worn, jammed)	Replace or free
5. Soiled, burnt or unsoldered commutator	Clean soiled commutator with petrol or alcohol. If burnt or mica protruding between bars (heavy sparking in operation), strip starter motor and have commutator lathe machined, insulation scraped or milled and commutator polished. If necessary have commutator resoldered or armature replaced.
6. Brush springs broken or heat-worn	Replace brushes.
7. Shorted armature	Replace armature.
8. Part of field coils disconnected (connection broken)	Replace stator.
9. Faulty switch box (connection resistances)	Replace switch box.

B) Starter motor not turning after being switched on

1. Lead to terminal "30" on the switch or between terminal "30" and stator broken	Repair connection
2. Lead to switch terminal "50" broken	Repair connection.
3. Faulty switch box	Replace switch box
4. Switch points badly burnt	Replace points or complete cover (always including the contact bridge)
5. Switch winding broken	Replace switch.
6. Switch shorted (poor switch pull, switch getting hot)	Replace switch
7. Sticking switch armature	Free, clean and lubricate lightly with oil

C) Starter motor running idle

1. Engaging mechanism damaged	Repair or replace mechanisms.
2. Pinion jamming on shaft	Repair (sometimes shaft requires straightening).

D) Starter motor will not get out of engagement

Disconnect battery at once (earthed pole—see above)

1. Faulty switch box	Replace switch box.
2. Switch points (6, 9, 10) sticking	Replace points (including contact bridge) or complete switch.
3. Pinion seized on shaft	Replace pinion bearing, remove burr on shaft (check shaft for true running)

E) Starter motor will not push pinion into engagement, pinion milling ring gear

1. Damaged flywheel ring gear	Repair or replace ring gear: trace cause of trouble!
2. Broken engaging spring (8)	Replace spring.
3. Damaged pinion teeth	Replace pinion; trace cause!

F) Starter motor can be heard to engage pinion, but will not turn the engine (see also "B")

1. Discharged battery	Charge battery.
2. Damaged free wheel (free wheel slip; broken casing)	Replace free wheel.
3. Burnt switch points	Replace points.
4. Stator field winding broken (usually lead to switch terminal)	Replace stator; (overlapping is questionable).

G) Noisy starter motor

1. Starter motor loose on flange (on engine)	Tighten fast.
2. Armature loose (or seized) in bearings	Repair armature.
3. Mechanical trouble (different kind)	Remedy trouble.

13.11 WINDSCREEN WIPER

Technical Description

The rotary windscreen wiper consists of the wiper motor with a gear casing, a lever system driving the wiper arms, and two wiper arms with wiper blades.

The two-pole wiper motor with permanent magnets is a two-speed unit with self-lubricating bearings. The gear casing comprises an epicyclic gear and an automatic self-parking device. The shaft runs in self-lubricating bearings, the gears being lubricated with grease packed into the gear casing. The lever system (leverage) includes self-lubricating joints and bearings.

Windscreen wiper type – for left-hand steering	PAL 443.122 – 081.071
– for right-hand steering	PAL 443.122 – 076.071
Rated voltage	12 volts
Rated current	4 amperes at high speed, 2.5 amperes at low speed
Wiping cycles per minute	60 at high speed (minimum) 20 (minimum) to 50 (maximum) at low speed
Difference of cycles between speeds	15 cycles per minute (minimum)
Direction of rotation when viewing the output shaft	anticlockwise – for left-hand steering clockwise – for right-hand steering

Removal and Refitting

According to the nature of the required repair, remove either only the motor with the gear casing after having disconnected the pullrod from the crank, the crank from the gear casing, and the gear casing from the bracket, or remove the complete unit after removing the wiper arm bearings – see wiper arm drive.

When refitting the windscreen wiper unit, observe the assembly position of the wiper crank – see the following paragraph "Motor and Gear Casing". For position of the wiper arms (blades), see the paragraph "Wiper Arms". Install the bracket into the body bulkhead and fasten it in position with the nut, using a rubber and a flat washer.

Cleaning and Repairs

When disassembling the windscreen wiper motor, do the following jobs:

1. Replace worn brushes and use petrol to clean motor parts after blowing the dust out of the brushes; make sure that the brushes move freely in their cells.

2. If the commutator is dirty, clean it with petrol, if it is damaged, re-turn and polish it.

3. During cleaning, the self-lubricating bearings must not come into contact with the cleaning (degreasing) agent (petrol, etc.). They should be lubricated only with a low-pour-point oil dripped into the cut-outs of the cup retaining the ball bearing and the felt. Use only as much oil as the felt can hold.

4. For the epicyclic gear in the gear casing use greases specified in Chapter 15.3 – either of foreign make or of Czechoslovak make – recommended specifically for windscreen wipers.

MOTOR AND GEAR CASING

Parts of the motor with the gear casing (or geared motor) is the wiper bracket, the protective housing, and the driving crank. When installing the wiper, put the housing on the motor with the gear casing and clamp it from below. Bolt down the bracket using plain washers under the bolts. Fasten the motor earthing cable under one of the bolts.

Fasten the crank in position using a nut and a spring washer while observing its assembly position:

a) with wipers for left-hand steering – toward the right-hand side of the motor and deflected 13° downward from the axis parallel with the centre line of the motor;

b) with wipers for right-hand steering – toward the left-hand side of the motor and deflected 17° downward from the axis parallel with the centre line of the motor.

Dismantling the Gear Casing

1. Remove three screws and lift away the cover.

2. Press against the primary (drive) shaft to push out the gear train. If necessary, slip the the double gear off the shaft and remove the planet wheels.

Dismantling the Motor

1. Unscrew the nuts of the clamping bolts, remove the commutator end shield and the stator, and then lift away the rotor. To prevent the rotor from being removed together with the stator, hold it in position by gripping the shaft in the gear casing or, if the gear casing is closed, by gripping the gear casing shaft.
2. If the brushes are worn, unsolder their cables from the insulated conductors; if the brushes are not soldered, cut them off at the points of pressing down. Make a note of the colours of leads (conductors) appertaining to the individual brushes.

Reassembling the Motor

1. Fit the oil-thrower ring to the commutator on the rotor and locate three washers on either side - the place of the felt washer is between the two rubberized washers. The thin (0.5 mm) washer should be installed first.
2. Solder the conductors to the brushes (if new brushes are used), insert springs under the brushes and check the free movement of the brushes. The two opposite brushes are of standard design, the third, obliquely placed brush is of special design with a slot.
3. Lift the brushes, fit the rotor shaft into the bearing, lower the brushes on to the commutator, and arch the conductors to prevent the brushes from seizing or short-circuiting to the frame.
4. Partially pull out the rotor and locate on it the thrust washer in the space of the gear casing. Loosen the adjusting screw.
5. Install the stator so that the two index lines are opposite each other, fit the rear cover, slip spring washers on bolts and tighten the nuts holding down the commutator end shield.
6. Adjust the rotor axial play to a value of 0.2 to 0.3 mm using the adjusting screw, and lock it in position by tightening the nut.
7. Tap the end shield and the housing lightly to settle the rotor in its bearings.
8. Connect the motor to the battery and check it for proper running. The motor must rotate clockwise when viewing the rotor front end. If the motor rotates anticlockwise, turn the stator through 180 degrees.

Gear Casing Reassembly

1. Fit the planet wheels on the pins of the shaft carrier and lock them in position using washers and lock rings. First slip a washer, the double gear, and then further washers on the shaft. On reassembly, coat all contact areas (friction surfaces) and gear teeth with grease.
2. Rub grease into the packing in the casing, install the gears, and fill the space around the gears with grease to a half or two thirds of this space - see the paragraph dealing with cleaning and repairs.
3. Insert the spring and its abutment plate into the centre cavity of the cover. Coat the mating surfaces of the casing, cover, and packing with sealing compound, slip lock washers on the bolts and bolt down the cover.
4. Check self-parking of the wipers. If it is not satisfactory, remove the cover, press out the lid above the adjusting screw, adjust the self-parking, and then refit the cover.

To Adjust Self-parking (motor run-out)

For adjusting use the screw in the cover - for access to the screw see paragraph 4 of section "Gear Casing Reassembly".

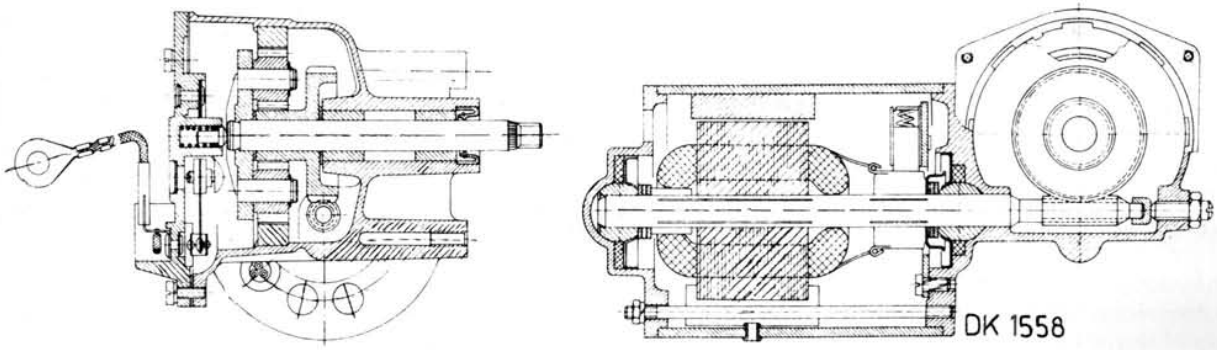


Fig. 13.11/1 - Sectional View of Windscreen Wiper (motor and gear casing)

1. If the wiper moves with the switch in the OFF position after its connection to the electric power supply, tighten (screw down) the screw till it begins to be litfed by the gear cam and till the wiper begins to be switched off and braked. Screw down the screw from this position by another half turn.
2. Press the lid into the cover and seal it with paint.

WIPER ARM DRIVE

This drive consists of the wiper bearings with cranks, the tie-rod of the cranks, and the driving tie-rod. The drive is installed in the car as a unit.

Tie-rods

The tie-rods should be slipepd on the crank pins in the following sequence: a spring washer with its centre camber facing outward (away from the pin), a flat washer, the tie-rod, a flat washer, and a lock ring.

If necessary, lubricate the joints with grease – see the following section dealing with bearings. Fill the cover at the point of the tie-rod motor crank connection with grease (of any brand) and slip it on the tie-rod.

Bearings

On one side, the bearing is inserted into the wiper bracket from inside the body, on the other side, it is fitted into a special washer inserted with its nose foremost into the respective hole in the body. Locate a sealing washer with carefully smoothed-out edges and a flat washer from outside, and secure the entire unit with the respective nut. The unit is sealed off by a rubber packing. Fill the unit with grease (see Chapter 15.3 for recommended foreign brands or Czechoslovak brands SP 4 or A 4) and press it down into the neck of the bush.

If it is necessary to remove or disassemble the bearing, prise the lock ring out of the pin groove under the rubber packing. On reassembly, insert a spring washer under the bush with its cambered centre toward the bush. Lubricate with the specified grease.

Wiper Arms

The wiper arms fitted with a rubber blade can be swung away from the windscreen. They are held down by nuts on the grooved tapers of the bearing pins.

After having fitted the wiper arms, spray water on the windscreen and test the run of the wipers. If necessary, turn the wiper arms on the pins. The wipers must wipe the largest possible area of the windscreen without, however, touching the windscreen glazing moulding.

13.12 RADIATOR FAN

Technical Description

The fan is an assembly of the fan motor and impeller. The impeller is pressed on to the motor shaft.

The motor has permanent magnets and a rotor running in self-lubricating bearings. The impeller is made of plastic.

Motor type	PAL 443.132 - 097.045
Rated voltage	12 volts
Rated current	7.5 amperes
Rated output	55 watts
Direction of rotation	clockwise (right-hand) when viewing the front end of the shaft
Cable poles	cable with lug (blue) - negative pole cable with female connector (red) - positive pole

Removal and Refitting

The fan is accessible after removing the radiator to which it is fastened by means of a rim held down by capscrews and spring washers. The motor rests on resilient bushes in the rim. When refitting the fan make sure that there is a spacer tube in the bush, locate the flat and the spring washers, and tighten the nut.

Cleaning and Repairs

Refer to paragraphs 1 to 3 dealing with cleaning and repairs in Chapter 13.11.

Dismantling Motor and Impeller

The motor can be removed (and dismantled) only after removing the impeller. Use the puller MP 8-102 to pull off the fan or support the fan hub in three points on its circumference and press out the motor by applying pressure on the motor shaft. No tapping or blows on the shaft are permitted.

1. Remove the nuts of the clamping bolts, hold the shaft by its grooved end, and lift away the commutator end shield and stator.

2. Partially pull out the brushes, brace the compression springs against them, and lift away the rotor. If necessary, unsolder the brushes and note the colours of conductors appertaining to the individual brushes.

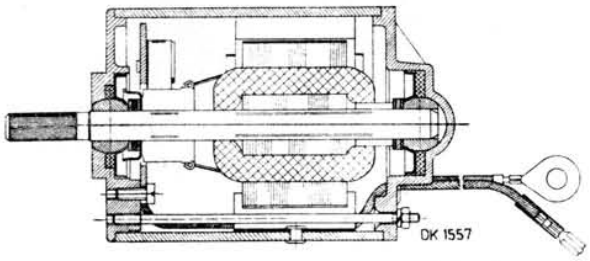


Fig. 13.12/1 - Sectional View of Radiator Fan Motor

Reassembling Motor and Impeller

1. Locate the oil-thrower ring on the commutator rotor and install three washers on either side - the felt washer has its place between the two rubberized washers. The thin (0.5 mm) washer should be installed first.
2. Solder the conductors to the respective brushes (when using new brushes), install the brushes letting them partially protrude. Let the compression springs rest against them in this position and adjust the conductor outlets and rubber grommets in position.
3. Slip the rotor into the end shield bearing, lower the brushes, and insert the compression springs into the guide slots. Arch the brush cables to prevent seizing of the brushes or their short-circuiting.
4. Hold the rotor by the grooved end of the shaft, install the stator with the slot toward the grommet and with its index line facing the line on the commutator end shield.
5. Fit the drive end shield and clamp the motor, using nuts and spring washers. Settle the rotor in its bearings by tapping the end shields lightly. Connect the motor to its power supply and test its running also with regard to the direction of rotation. If the motor runs in opposite direction, rotate the commutator end shield through 180°.
6. Support the end shield of the motor and press the impeller on the shaft flush with the shaft end in a smooth motion (no blows are permitted). Use a length of pipe or a ring to prevent direct contact of the motor shaft with the press.

13.13 HEATER FAN

Technical Description

The fan is an assembly comprising the electric motor with bracket and the impeller, and forming part of the heater. The impeller is pressed on the motor shaft. The two-pole motor has permanent magnets, and its rotor runs on self-lubricating bearings.

Motor type . .	PAL 443.132 - 084.025
Rated voltage .	12 volts
Rated output .	60 watts
Polarity of cables and terminals .	cable with lug (blue) – negative pole to the right-hand blade of terminal board cable with female connector– positive pole to left-hand blade of terminal board
Direction of rotation . .	anticlockwise (left-hand) when viewing the output shaft

Fan Removal and Refitting

These jobs can be done only with the heater removed from the car. They are described in Chapter 11.7.

Cleaning, Lubrication, and Repairs

Refer to paragraphs 1 to 3 in Chapter 13.11. The motor can be lubricated when removed from the bracket. Drip oil with a low pour point on the outside of both shaft ends where the bearings are mounted (after about every 1,000 hours of motor operation).

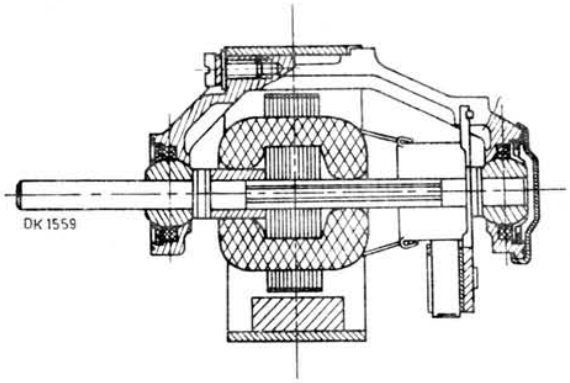


Fig. 13.13/1 - Sectional View of Heater Fan

Disassembly of Motor and Impeller

1. Spread the ends of the lock ring fitted on the impeller using pliers for Seeger rings or another suitable tool, slip off the ring, and pull the impeller off the shaft. The shaft must be supported to prevent damaging the mountings of the motor bearings.

2. Remove the clamping bolt from the bracket and lift away the motor.

3. Remove the other clamping bolt from the motor, lift away the stator and the brush springs, and push out the brushes. The other motor parts cannot be dissasembled.

Reassembly of Motor and Impeller

1. Install the stator with the slot facing the bosses on the frame and with its index line facing the line on the frame, and fasten the parts with screws and washers.

2. Install the brushes and brush springs, suitably arch the brush cables so that they do not obstruct the movement of the brushes and so that they cannot cause a short-circuit.

3. Tap the stator lightly with a soft mallet to settle it in the bearings, and lubricate the bearings.

4. Connect the motor to the power supply and test briefly its running and direction of rotation. If it rotates in the opposite direction, rotate the frame assembly through 180°.

5. Remove the clamping bolt of the motor on the terminal board side, install the motor in the bracket, and lock it in position with the bolt and washer.

6. Fit the spring on the motor shaft, support the shaft to avoid damaging the bearings, and press-on the impeller. The clearance between the impeller circumference and the bracket must be small, about 1.5 to 2 mm. Lock the impeller in position by pressing - on the lock ring - again the motor shaft must be supported.

7. Close the motor bearing from above by fitting the cover.

13.14 WINDSCREEN WASHER

Technical Description

The windscreen washer is a unit comprising a reservoir, a pump with motor, a distributor valve, two nozzles, and the connecting pipeline.

Windscreen washer type	MEZ MM 2004
Rated voltage	12 volts
Rated input	50 watts
Pump discharge, minimum	15 c. c. at a pressure of 10 MPa (1 kg/cm²)

Fitting, Removal, and Adjustment

The **reservoir** is held in its place by a cover band secured by capscrews with flat washers.

The **motor with pump** is bolted down, using flat washers under the capscrews. The suction branch socket is smooth, that of the discharge branch reinforced with a collar; the positive pole is connected to the suction side, the negative pole to the discharge side (when viewing the car from the front, suction is on the right-hand side, the discharge on the left-hand side).

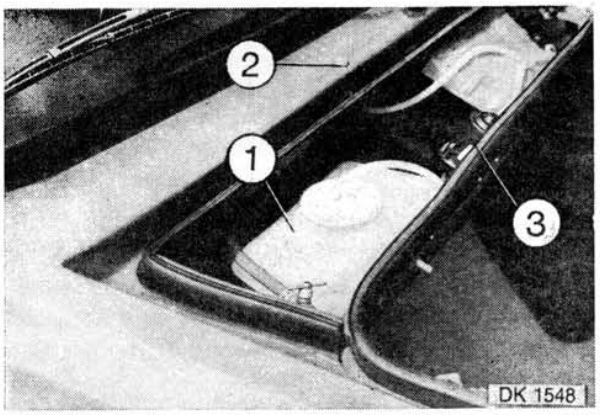


Fig. 13.14/1 - Windscreen Washer
1 - Reservoir, 2 - Spraying nozzles, 3 - Motor with pump

The **distributor valve** is fastened by a capscrew, the distribution pipeline being simply fitted on it.

The **nozzles** (heads with nozzles) are secured in position by pressing them down from above into bushings inserted into the car body by their necks. To adjust the required direction of the water stream, turn the nozzles to the respective angle using a needle inserted into the nozzle hole.

Filling the Reservoir

Open the reservoir by turning its cap anticlockwise. In summer, fill it with water or a mixture of water and one of the additives for windscreen washers available on the market, and in winter exclusively with an antifreeze of a brand intended specially for windscreen washers – never use an antifreeze intended for motor vehicle cooling systems.

Be careful if the body finish is touched up with other than baking enamel. Additives in the water and other liquids, usually containing spirit, are apt to leave unremovable spots on the enamel. Use only water when testing the windscreen washer.

13.15 INSTRUMENT PANEL

Technical Description

The instrument panel contains all measuring instruments and indicators recommended by

pertinent regulations and standards or desirable from the point of view of safe driving. Electrical connection is provided in the form of receptacles or sockets connected directly to the car wiring.

For the individual instruments and their design see Fig. 1.3/3 to 1.3/5. All instruments are of the expendable type.

The speedometer drive shaft is dealt with in Chapter 12.8.

Instrument Panel Removal and Refitting

1. Remove the four capscrews in the corners of the facia.

2. Disengage the speedometer drive by unscrewing the union nut of the flexible drive shaft. The instrument panel can be now pushed out of the facia.

3. Disconnect the terminal boards by pulling. On Škoda 105 S cars, disconnect also the earthing cable. Now the instrument panel is free to be removed from the car.

Proceed in reverse order when refitting the instrument panel.

Disassembly and Reassembly of Instrument Panel, Repairs, and Additional Connections

Instrument Panel Shown in Fig. 1.3/3.

Disassembly:

The instrument panel can be disassembled by removing its individual parts after having removed clips on the circumference of the cluster instrument and after having screwed off the speedometer fastening nut. In the case of temperature and fuel gauges, remove six capscrews at the edge of the back panel after removing the housings of the respective lamps, and lift away the panel with the instruments.

Reassembly:

Install parts of the instrument panel in the following sequence: cover glass, frame screen, screen with warning lamp displays (symbols), scale with speedometer, shield with fuel and temperature gauge. Insert a washer under the speedometer nut.

If terminal boards have been removed from the instrument panel, refit them in the following order: the white terminal board to the right, the red terminal board to the left (both with the blades pointing downward) when viewing the back of the instrument panel.

Install housings with blue lamps level with the speedometer shaft.

Repairs and Additional Connections:

In the case of a failure of the temperature or fuel gauge, it is necessary to replace the panel with both instruments. Any repairs are to be done only by a specialized service shop.

An additional cable may be connected to the terminal "9" of the ten-pole plug to use the surplus green warning lamp. Fit the lamp in its respective housing.

Instrument Panel Shown in Fig. 1.3/4

Instruments are held down by cover bands and nuts. The separate warning lamps are screwed down in housings on inserts with coloured glass and displays (symbols).

Mark the cables before disconnecting them to facilitate their correct re-connection. The following survey indicates the connection of plugs with electrical equipment.

Ten-pole plug - terminals "1" to "10" connect warning lamps (centre blade of the lamp holder) and the temperature gauge:
1 - High beam, 2 - Lubrication, 3 - Temperature gauge, symbol "V", 4 - Alternator operation, 5 - Fuel level; 6 - Left-hand direction indicator, 7 - Right-hand direction indicator, 8 - Brakes, 9 - Fog lamps, 10 - Unconnected

Six-pole plug - Terminals "1" to "6" connect:
1 - Instrument illumination (centre blade of lamp holder), 2 - Fuel gauge, black symbol; temperature gauge, plus symbol; peripheral blade of warning lamp holder: lubrication, alternator operation, fuel level (reserve), 3 - Fuel gauge, yellow symbol, 4 - Fuel gauge, blue symbol, 5 - Unconnected, 6 - Instrument illumination (peripheral blade of lamp holder); peripheral blade of warning lamp holder: direction indicators, high beam, brakes, fog lamps; temperature gauge, minus symbol

Instrument Panel Shown in Fig. 1.3/5

For fastening the instruments and warning lamps, and the connection of cables, refer to information concerning instrument panel shown in Fig. 1.3/4. The following survey indicates the connection of plugs with electrical equipment:

Ten-pole plug - connection identical with that of the instrument panel shown in Fig. 1.3/4.

Six-pole plug - connection identical with that of the instrument panel shown in Fig. 1.3/4. An exception is the additional connection of the tachometer: to the plus symbol of the terminal "2", to the minus symbol of the terminal "6", and to the symbol "1" of the terminal "5".

13.16 SWITCH BOX

The switch box forms part of the steering lock. For its operation and control symbols see Fig. 1.3/13. For switching on the ignition, only terminals "15", "30", and "50" should be connected.

Switch Box Removal and Refitting

Access to the switch box can be gained by removing the steering wheel shaft shrouds and

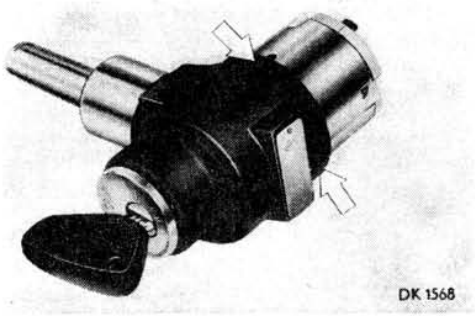


Fig. 13.16/1 - Switch Box with Steering Lock - the arrows indicate the capscrews (M 3.5) holding down the switch box in the steering lock housing

disengaging the shaft from the bodywork - see Chapter 7.8, paragraphs 1 to 5 - without, however, disengaging the shaft from the steering box.

The switch box can be removed after loosening two capscrews on the steering lock housing (see illustration).

Reverse this procedure when refitting the switch box. Turn the key and the key hole of the switch box into the left-hand extreme position (STOP), install the switch box in the steering lock, tighten the capscrews and secure them with a dab of paint.

13.17 SWITCHES OF LAMPS AND WARNING SYSTEMS, DIRECTION INDICATOR TICKER, RECEPTACLE

For the wiring of these electrical devices refer to Chapter 13.1 - Electrical Equipment Connections and Wiring Diagram - and for their operation to Chapter 1.3.

All the devices are expendable and they have to be replaced with new units if defective.

All the switches are of the contact type, special types and exceptional connections are mentioned in the following text.

a) Switch of parking lights and headlights (feeder of change-over switch of these lights)

The switch is fastened to the instrument panel by a nut with a washer under the push button. When installing the switch, turn it so that it engages in the locking slots. The push button can be removed by pulling it off and refitted by pressing it down.

b) Heater switch

This is fastened in the same manner as the switch sub a). Access to the switch body can be gained by removing the centre panel of the facia after removing two capscrews on the panel bottom. It may be also necessary to pull off the heater control push buttons.

c) Switch of disability warning lights

For fastening see information sub b). The switch operates only when connected to the direction indicator ticker.

d) Dipswitch, direction indicator, horn, windscreen wiper, and winscreen washer switch

This switch is installed on the steering column shaft and fastened to the reduction sleeve of the tube with shaft bearings and to the top part of the steering wheel shaft shroud.

Removal:

Remove the steering wheel and the bottom part of the shroud - see Chapter 7.8. The switch can be released from the shaft after loosening the screw in the driver and the removal of the driver (if the switch is equipped with such driver), and the loosening of the screw in the yoke on the switch bottom right-hand side. Loosen or remove the fastening screws of the shroud and lift away the top part of the shroud.

If you intend to remove also the steering gear, do not loosen the screw on the switch bottom right-hand side but the screw on the left-hand side, and lift away the switch together with the reducing sleeve on the steering wheel shaft tube.

Refitting and Adjustment

Reverse the described procedure when refitting the switch. If the car is equipped with an automatic direction indicator cancelling

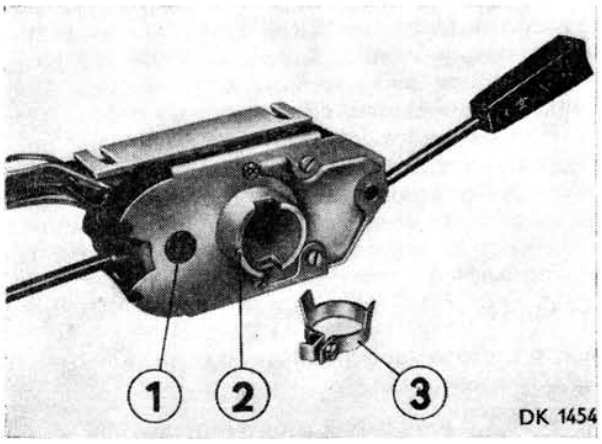


Fig. 13.17/1 - Adjusting Elements of Direction Indicator Self-cancelling Device

1 - Centering pin of the left-hand switch or mark on the switch face, 2 - Boss on the bush face, 3 - Driver

device (represented by the driver fitted on the shaft), adjust the switch and install the driver. Using the steering wheel, straighten the front wheels, turn the outer bush with the boss facing the centre line of the centering pin of the left-hand switch, install the driver, and secure it on the steering wheel shaft by tightening the screw.

e) Switch of auxiliary headlamps

It is installed on the auxiliary panel on the left under the facia and held in position by a nut with a washer. Its push button can be unscrewed.

f) Switch of reversing lamps

This is a special contact-type switch screwed into the gearbox right-hand side wall over an underlying packing.

g) Courtesy light switches

One switch forms part of the light (see Chapter 13.8), the otehr is installed in the door frame and held in position by a single capscrew with a rubber washer preventing water from getting into the switch.

h) Oil pressure monitor switch

This is a special contact-type switch screwed directly into the engine - see Fig. 15.3/3. If there is a defect (with the ignition on, the warning lamp does not come on or it continues glowing at increased engine speed), first check the electrical system and then loosen the switch to see whether the oil pump is supplying oil (in which case the oil will escape past the switch thread).

i) Switching relay

This relay is installed on the partition in the luggage boot between the cover of the brake and clutch master cylinders and the car side. It is fastened by capscrews with washers. One capscrew holds down the earthing cable.

The low relay control current makes the connection for the higher operating currrent. The relay is incorporated into the circuit of the main and auxiliary headlamps and fog lamps according to the equipment of the car. For its wiring see Chapters 13.1 and 13.18.

j) Stop-light switch

For its location, installation, and adjustment see Chapter 12.1.

k) Brake pedal travel signalling switch

For its location, installation, and adjustment refer to Chapter 12.1.

l) Fuel level signalling switch

This switch is installed on the fuel tank under the righthand rear seat. It consists of a control float with a contact arm moving along a potentiometer with a contact plate for a direct signalling of the low fuel level. It is provided with a packing and held down by capscrews.

The potentiometer and the contact arm (sliding contact) can be replaced after removing the unit from the fuel tank. When removing it, avoid any possibility of a short-circuit which could ignite petrol vapours in the fuel tank. For the connecting sequence of cables refer to Chapter 12.6 - Installation of the fuel tank.

m) Direction indicator ticker

The ticker with its holder is installed on the positive stop provided on the rear wall of the ashtray in the facia. It is accessible after removing the facia centre panel–see paragraph b). The ticker contacts must point downward. Use cables between the identically marked terminals "Z", "P", "+" on the ticker and the switch to connect the ticker to the switch of the disability warning lights. Basically, the ticker is a thermoelectric circuit breaker with acoustic signalling. It operates at a frequency of 60 ± 30 flashes per minute, a voltage of 12 volts, and a current load of 40 watts (two lamps, each with a 21 watt rating).

If the flashing frequency deviates from the specified value, the tickers of certain makes can be readjusted. The adjusting screw is accessible after removing the seal on the contact plate. After having finished the adjustment, secure the adjusting screw with a dab of paint and seal the hole again. Connect the current load to terminals "+" and "Z" ("P" is an additional load - disability lights).

n) Temperature gauge primary element

The primary element is fitted in the cylinder head and sealed by a sealing ring. It is not a direct switch but a thermistor element changing the resistance to the curent passing through it toward the temperature gauge in accordance with the changing temperature.

o) Carburettor idling jet separator

This is an electromagnetic needle valve screwed down into the carburettor. When not energized, it shuts off the flow of fuel through the idling jet thus preventing self-ignition of the mixture in an overheated engine.

p) Receptacle

This is a socket for a cylindrical plug. Its location is shown in Fig. 13.1/2. When removing it, hold its lower part (from inside the car), and unscrew its upper part proceding from under the boot lid. The lower part of the receptacle must have a clean metal-to-metal contact with the bodywork.

13.18 FOG LAMPS AND OTHER OPTIONAL EQUIPMENT

Fog lamps

The fog lamps are optional equipment. When fitting them on the car, refer to the wiring diagram while observing national regulations (international regulations have not yet been unified as far as individual requirements are concerned) and the following information. In Czechoslovakia, the Decree No. 100/1975 of the Book of Statutes, paragraph 51, is applicable.

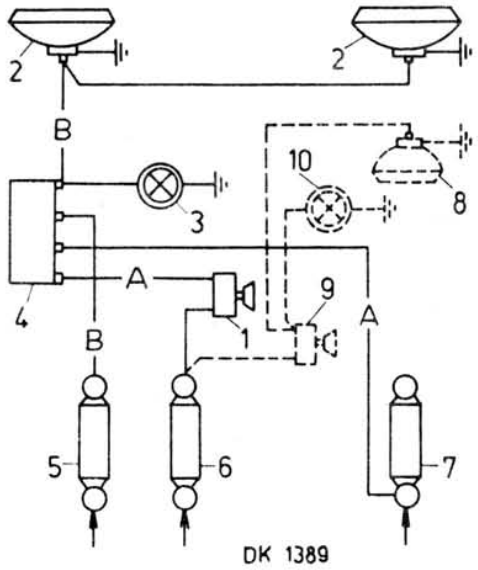


Fig. 13.18/1 - Wiring Diagram of Fog Lamps

1 - Switch, 2 - Fog lamps, 3 - Warning lamp, 4 - Switching relay (A - relay closing circuit, B - fog lamps feeding circuit), 5 - Fuse No. 1 of car electrical equipment, 6 - Fuse No. 4 of car electrical equipment, 7 - Fuse No. 7 of car electrical equipment, 8 - Fog tail light, 9 - Switch of fog tail light, 10 - Warning lamp

Switches

Install them on the auxiliary panel (standard part of the car) under the facia. Use the switch with the built-in warning lamp for the tail light.

Warning lamps

Use the unconnected green warning lamp in the instrument panel for fog lamps; the warning lamp appertaining to the tail light is built-in in the switch.

Switching relay

Use a switching relay of the same design as for the auxiliary headlamps (on cars with twin headlamps) or another relay operating in the same way. Any place can be chosen for its incorporation into the circuit.

Cables

For warning lamps and the relay switching circuit use cables with a section of 0.75 mm², for the remaining electrical equipment 1.5 mm² section cables.

RELAY SWITCHING OF HEADLAMPS

Optional equipment may include an incorporated relay for switching in the headlamps. In some countries (for example Sweden), this relay is required by regulations. For the respective connections see the following wiring diagram.

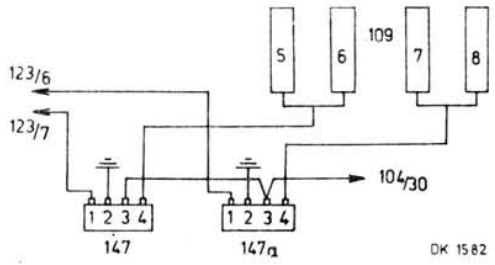


Fig. 13.18/2 - Wiring Diagram of Headlamps Using Switching Relay - additional incorporation into the basic electrical equipment (Fig. 13.1/1)

147 - Relay of main headlamps
147a - Relay of auxiliary headlamps

Heated Rear Window (1979 on)

Circuit

Divide into two sections.

1. Heater switch with five positions from left to right. a) Heated screen b) off c) High speed fan d) Slow speed fan e) Slow speed and heated screen.
2. Power supply.

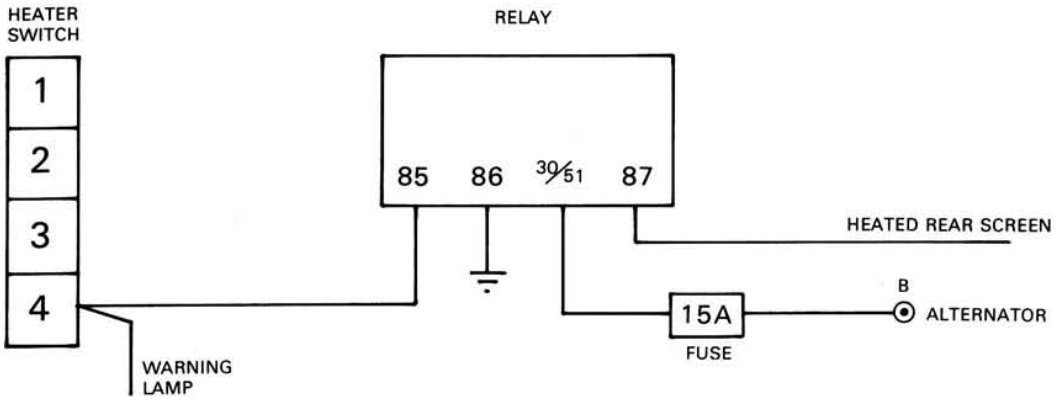


Fig. 13.18/3

Relay Specification. 443.811-445.530
Rated Voltage 12V
Service voltage 14V
Maximum current 16A
Switching IN voltage 6.5 – 7.5V
Dropout voltage 1 – 3V
Points clearance 0.9 – 1.1 volts
Armature clearance 0.9 – 1.1 volts
Adjusted only when cold

14 - BODYWORK

Technical Description

The bodywork is of the all-metal, closed four-door, five-seat, integral (chassisless) type with front and rear seats housed in its interior. It is designed as an independent framework carrying the exterior and interior equipment. The stampings forming the body are made of auto body steel sheets.

The supporting part of the bodywork is welded from three main floor panels, the front, centre, and rear floor board. Moreover, it incorporates fixed welded parts, e. g., door frames integral with rear wings, the roof, and the frames of the windscreen and the rear window together with the rear window ledge (or parcel tray behind the rear seat backrest), as well as removable parts, e. g., front and rear doors, front wings, the front-end and the rear-end panels, the boot lid, and the engine bonnet. The main chassis assembly groups and chassis accessories are bolted to the body base part. The spare wheel carrier is in the forebody.

The engine bonnet swings upward, the boot lid to the left. When open, the bonnet and the lid are hled in position by struts. Their locks and latches are controlled from inside the car, see Chapter 1.3.

The doors of frame design are welded from two main stamped parts, the lower parts of the doors being formed by two stampings (outside and inside) mutually connected and edged along their circumference, the upper parts (window frames) being made of rolled sections. The doors are hinged on front faired hinges and, when open, they are held in position by door limiters. The front doors can be locked from outside, and all four doors can be latched from inside. The rear doors are provided with adjustable safety latches preventing their opening from inside the car. Weatherstrips are used for sealing the doors.

Safety glass is used all round. The windscreen and the rear window are embedded in glazing rubber mouldings, the front and rear doors are provided with drop windows (with Škoda 105 S, the rear windows are fixed).

The facia is a plastic mounting panel attached to the upper part of the scuttle dash.

The two front seats are separate and they slide independently. The rake of their backrests is adjustable. In Škoda 105 S, the backrests are fixed. The headrests in Škoda 120 LS are adjustable.

The two-part bench type rear seat is tiltable to give access to the interior luggage compartment behind the backrest. The seats can be converted into berths with the exception of Škoda 105 S, and a loading area can be formed by folding only the rear seat.

The covers of the front and rear seats comply with special specifications. The ceiling and door panels are lined with plastic leather. The doors are provided with pulls (hand grips) which serve also as arm-rests. Škoda 105 S has only door pulls.

The interior appointments include two sun visors, a rear-view mirror, an ashtray in the facia, and courtesy lights above the front doors. With the exception of Škoda 105 S, there are also ashtrays in the rear doors and hand grips with coat hangers above the rear doors. In Škoda 105 S, the coat hangers are affixed to the centre post.

The floor boards are lined with insulating and damping materials, and their lower (outer)

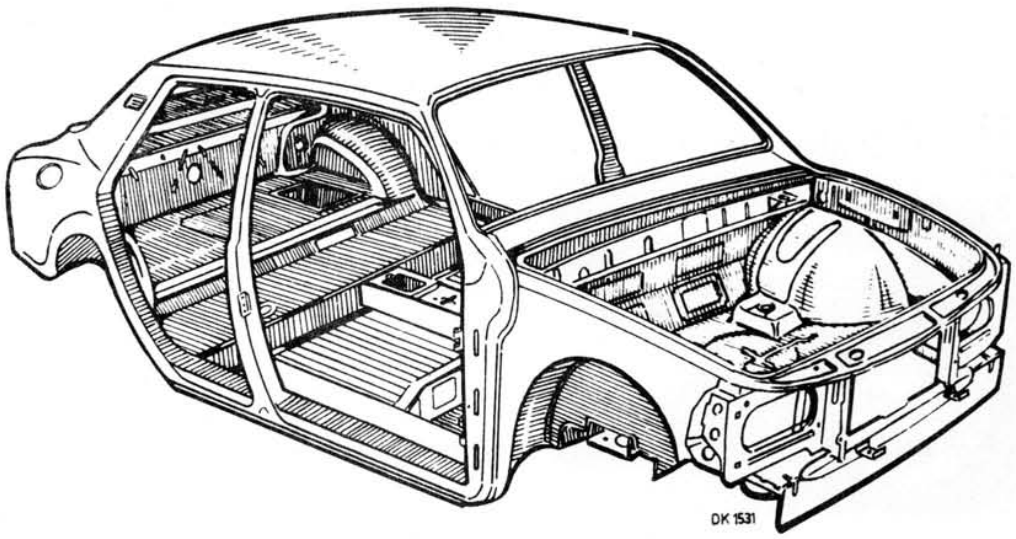


Fig. 14./1 - Bodywork Structure

surfaces are sprayed with a protective compound. The floor boards including the floor of the boot are covered with textile carpets while rubber mats are used in Škoda 105 S. The interior luggage compartment is lined with insulating felt sheet.

The body finish consists of several layers of special anti-corrosive coatings, a primer coat, and a synthetic baking enamel top coat in colours complying with a special specification.

14.1 BUMPERS

To Remove Front Bumper

Disconnect the leads of the horn and front direction indicators. Remove bolts connecting the side sections of the bumper with the wings and bolts of the bumper brackets, connecting them to the wheel splash guards. Now the entire bumper is free and it can be removed.

Te Remove Rear Bumper

Proceed in the same way with the exception that there are no leads to be disconnected.

To Remove Overriders

Screw off the nut M 10 and lift away the overrider.

14.2 WINGS

To Remove Front Wing

First remove the front bumper (see Chapter 14.1), the front door (see Chapter 14.5), and, in the case of the left-hand wing, the boot lid (see Chapter 14.3). If the door sill is covered with a trim moulding, loosen this moulding partially.

Now remove the bolts fastening the wing to the bodywork under the sill (from underneath), on the side edge of the body post, in the channel next to the boot, and in the forebody under the headlamp.

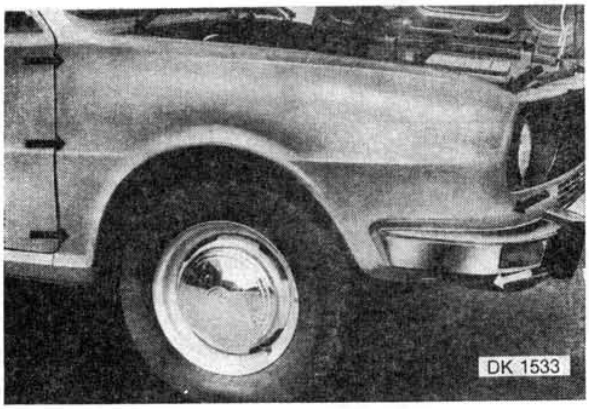


Fig. 14.2/1 - Removing Front Wing - arrows indicate fastening points

To Reinstall Front Wing

If the seal strip in the front part of the wing is damaged, replace it with a new one, and stick it on if it has got unstuck. Pack always a new sealing strip between the wing edge and the body framework. Then install the wing in position and locate it by tightening slightly the connecting (fastening) bolts. Do not tighten the bolts firmly before having fitted properly the wing.

14.3 BONNET AND BOOT LID

Removing Boot Lid

Remove the nut and bolt of the strut and the screws fastening the hinges, and lift away the complete lid.

Removing Engine Bonnet

Slip the bonnet strut out of its guide, screw off the nuts of the hinge fastening bolts, and lift away the bonnet.

Reinstallation and Adjustment of Boot Lid and Engine Bonnet

Install the lid (or bonnet) over the luggage (or engine) compartment and tighten lightly the bolts and/or the nuts of the hinge bolts. Make the lid (or bonnet) fit perfectly with the edges of the bodywork by shifting the hinges in their respective holes as necessary, and tighten fast the bolts and/or nuts of the hinges. Assemble the strut of the boot lid.

Boot Lid Release Rod and Engine Bonnet Release Cable

The release rod of the boot lid (Fig. 1.3/13) is connected with the relay link by means of a pin and forms an assembly unit with the lid locks. The handle of the release rod can be removed after pushing out the pin. The entire assembly can be lifted away after removing the lid locks.

Reverse this procedure to reinstall the assembly. Tighten the bolts of the locks lightly and fit the lid properly in position. Now adjust

the release mechanism to ensure its correct operation and tighten firmly the bolts.

The engine bonnet release is operated by a litz wire (cable) threaded through the Bowden tubing. To remove the litz wire, detach it from the bonnet lock and pull it out of the tubing. When reinstalling it, thread it again through the Bowden tubing.

14.4 BODY FRONT-END AND REAR-END PANELS

To Remove Front-end Panel

Remove the front bumper (see Chapter 14.1) and then the bolts fastening the lower part of the front-end panel to the wheel arch under the headlamp and to the lower edge behind the bumper.

Now the upper part of the front-end panel – the grille, consisting of three parts – can be lifted away after removing its fastening bolts. First remove the outside parts an then the centre part of the grille.

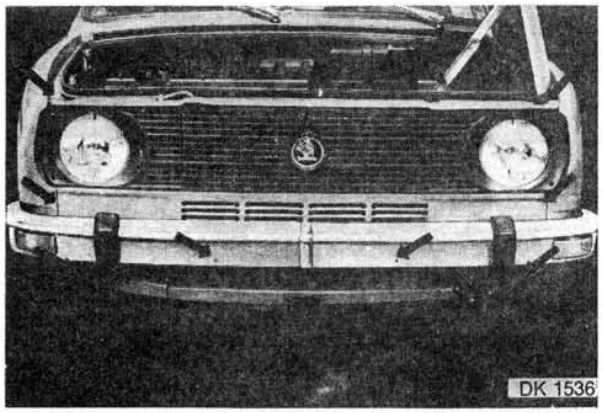
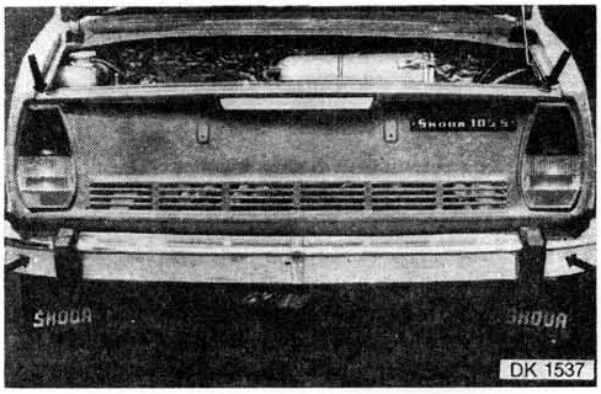


Fig. 14.4/ – Removing Front-end Panel – fastening points are indicated by arrows

To Remove Rear-end Panel

Remove the rear bumper (see Chapter 14.1) and detach the engine bonnet release cable, disconnect the leads of the rear lamp clusters and the licence plate light, and slip the leads out of the clips. Finally remove the bolts fastening the rear-end panel to the bodywork from the engine bonnet channel next to the lamp clusters. Disengage the panel in the backward direction with a blow of the hand.



Fi4. 14.4/2 – Removing Rear-end Panel – fastening points are indicated by arrows

To Reinstall Front- and Rear-end Panels

Place the panel in position and tighten lightly the fastening bolts. Tighten the bolts firmly only after having properly fitted and embedded the panel.

To reinstall the grille, reverse the procedure of its removal.

14.5 DOORS

To Remove, Reinstall and Adjust the Doors

The inner door mechanisms, locks, window wind-up mechanisms, door limiters, and windows can be removed and/or adjusted only after having first removed the inner door handles, the arm-rests, the door pulls (of Škoda 105 S), and the door lining panel including the insulating liner – see Fig.14.5/1.

a) Remove the screw below the inner handle and lift away the handle bush. Using a suitable tool, prise off the cover plate of the drop window crank. Remove the cleared screw of the crank and withdraw the crank.
b) Remove screws fastening the arm-rest or the screw of the door pull (in Škoda 105 S).
c) Remove the door lining panel. Using a suitable tool with a pad (see Fig. 14.5/1), remove the fastening clips (flexible spacing pins) beginning midway of the door panel (of the front and rear doors), and proceed along its entire circumference.
d) Peel off carefully the inner insulating liner cemented to the inner part of the door.
e) Remove the screws fastening door hinges to the body framework and lift away the doors.
f) Reinstallation is practically an assembly of the parts in the reversed sequence of their removal. It is very important to locate and cement correctly the insulating liner – foil.

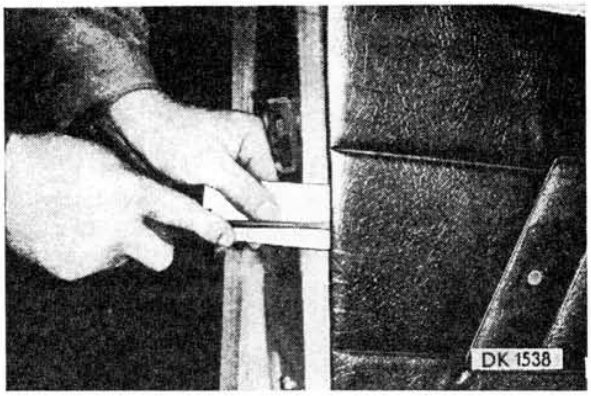


Fig. 14.5/1 - Prising off Door Panel

When it is raining or when washing the car, water runs down the glass and penetrates into the inner space of the door. The foil is supposed to prevent the forming of under-pressure in the car interior and to prevent the water from soaking the interior trims and running down into the car. Therefore, it has to be stuck on by rubber cement as shown in Figs. 14.5/2 and 14.5/3 (cross hatching). First slip the lower part of the insulation (foil), the inner end, inside the door, and then apply a sealing compound on to the door inner metal-sheet panel and the insulation as indicated in the illustration (black dots).

g) Close both doors on the side to be adjusted and visually assess which areas of each door require re-positioning to produce an even contour joining the front and rear wing body lines in relation to the door heights.
With careful adjustment of hinges, satisfactory body lines can be obtained.
Hinges can be moved on the door pillar in the following ways.
1. Up and down after slackening bolts. Result: height of door in relation to door aperture.
2. In and out after slackening bolts. Result: Position of the door leading edge in relation to body aperture.
3. Shims Pt. No. 113-988900 between hinges and pillar
   a) Shims under both hinges moves the door rearwards and increases the gap between the door leading edge and the wing (Front door).
   b) Shims under the bottom hinge only, will lift the lower edge of the door.
   c) Shims under the top hinge only, will have the reverse effect.

It is sometimes preferable to remove the door catch (On pillar) to remove misleading stresses being placed on the door. This part being re-fitted and adjusted so that both stages of the lock are working and ensuring door is not being stressed by excessive tension up or down, in or out.
Adjust the door catch to ensure when the door is closed, it will not ride up or down.
Ensure the door does not catch the door pillar, wing, other door etc., when both are open or closed.

Door top half

If you have correctly adjusted the bottom half of the door you may find that the window frame top half still needs an adjustment.

Here it will be necessary to lower the moving window and carefully bend the frame of the window to match the frame of the door.

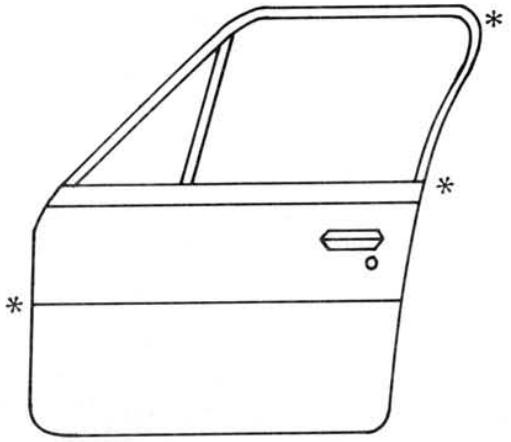


Fig. 14.4/1A

Common Areas the Door Touches

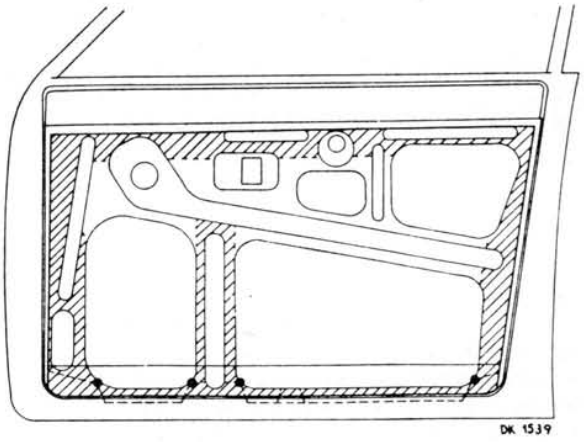


Fig. 14.5/2 - Front Door Insulation - cross hatching indicates where rubber cement has to be applied, black dots indicate sealing compound application

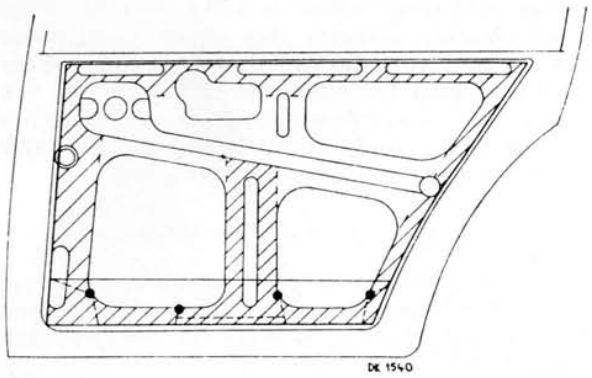


Fig. 14.5/3 - Rear Door Insulation - cross hatching indicates where rubber cement has to be applied, black dots indicate sealing compound application

fastening screws after having adjusted the door.

To Remove Door Handle, Lock and Catch Mechanisms

This is a current dismantling procedure including removal of the individual parts. It begins by pulling out the pull-rods from the control levers. A simultaneous slipping out of the clip (made of plastic and forming the bearing and its holder) of the lever of one of the parts testifies to an excessive clip wear. In such a case, the clip has to be replaced with a new one on reinstallation of the part.

Handle, Catch, and Lock

1. Lubricate the sliding surfaces of the catch (or the so-called outer door lock) with grease. Turn the catch to the closed position (so that it can be inserted into the door) and bolt it down.

2. Install the lock into the front door with the latch towards the outer lock and secure it in position with the retainer. Slip a spring washer on to the latch pin and screw down the pin.

3. Insert the handle provided with its respective relay rod into the door cavity, locate the stirrup, and screw down the nuts carefully after having coated the fastening bolts with some of the commercial preserving preparations (RESISTIN ML, TECTYL, etc.) to facilitate disassembly in the future. Adjust the length of the relay rod so that it is not stressed after installation. The end pieces of the relay rod are of plastic material. Use suitable pliers to press them over the ball pins.

4. Insert the inner handle into the cavity of the inner door sheet-metal panel and locate it with a screw with a plain and a spring washer. Do not tighten the screw. Screw down the other screw below the handle together with the bush - see the paragraph "To remove, reinstall, and adjust the doors".

5. Check the catch for correct function when in action with the handle and, in the case of the front door, also with the lock.

Relay Rods (links) of Inner Mechanisms

6. Disengage the catch of the door using the outer handle. Insert the rod of the inner handle into the door, press the respective ends of the rod into the lower clip in the catch and the clip of the inner handle, and tighten the screw of the inner handle.

7. Press the rod bushing into the inner sheet-metal panel of the front door. Slip the rod of the inner door latch through the bushing into the door cavity and press the end of the rod into the clip of the lower part of the bifurcated catch lever.

8. Press the rod bushing into the inner sheet-metal panel of the rear door. Install the rod relay lever with its longer arm toward the catch and secure it in position with a loosely screwed-on nut. Do not forget to place a plain and a spring washer under the nut. Place the long rod with its short bend into the clip of the upper part of the bifurcated catch lever and with the long bend into the longer arm of the relay lever. Thread the short rod of the inner latch through the bushing into the door cavity and press the end of the rod into the clip of the relay lever shorter arm. Tighten firmly the nut of the relay lever.

Press the clip preventing the rod from vibrating into the inner door sheet-metal panel from its inner side, and push the rod firmly into the clip.

Check all functions of the handle: engaging and disengaging of the catch as well as the engaging and disengaging of the child-proof (safety) latch. Adjust the position of the rods (links) by shifting the inner handle mechanism as necessary (or, in the case of the rear door, by shifting the mechanisms of the relay lever), and then tighten firmly all screws and bolts.

Antivibration Door Stiffeners

These stiffeners are inside the doors (in the door inner space). They are welded to the door side and cemented to the outer door stamping. If the cementing has been disturbed when reconditioning a damaged door, straighten the stiffener and apply a damping compound between it and the door stamping to exclude a direct contact of these parts. When repairing the door by flame welding, spot-weld the stiffener to the door stamping in several points.

Door Catch Retainer

The position of the door catch retainer on the door pillar and/or the rear wing face can be adjusted within certain limits after loosening its fastening screws. Adjust the retainer in the required position, check the door for correct closing and fitting with the other parts of the bodywork, and then retighten the screws. The door catch must slide on to the leading surface of the retainer so that it rests against it.

Sometimes, it may be necessary to place a packing piece under the retainer (to prevent the fouling of the door catch pin). In such a case, mark the position of the catch on the bodywork, slacken the screws, and install a packing piece under the retainer slipping it over the lower screws and tipping it into position on the upper screws.

It is important to observe the correct angle of the inclination of the retainer leading surface, which has to correspond with the inclination of the bearing surface of the door catch (outer door lock). Therefore, fasten the base plate of the retainer so that its upright stiffener is parallel with the edge of the moulded recess for the retainer on the door pillar and the rear wing.

The leading surface of the retainer is provided with a friction plate. In the case of damage (excessive wear, impact of an incorrectly adjusted door, etc.), prise off the original friction plate and fit a new one. If the friction plate is lacking or if it is excessively worn, the door is apt to rattle.

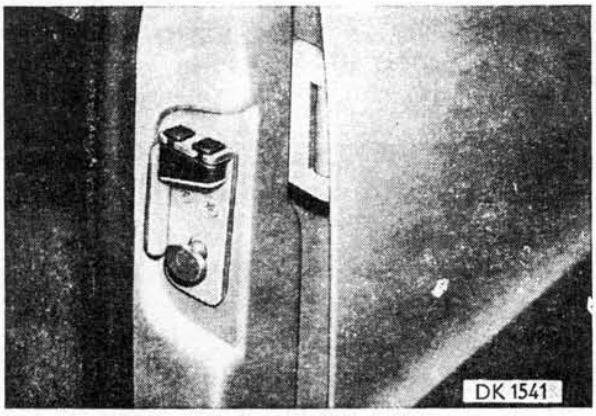


Fig. 14.5/4 - Door Catch Retainer

14.6 WINDSCREEN, REAR WINDOW, SIDE WINDOWS

To Remove Windscreen and Rear Window

Remove the connection of the spacing insert and lift away the spacing insert of the glazing rubber moulding using a suitable tool. Now press carefully against the glass from inside the car and slip the lip of the glazing rubber moulding step by step over the edge of the windscreen or window frame along its entire circumference, and finally lift away the glass together with the glazing rubber moulding.

To Refit Windscreen and Rear Window

First clean thoroughly the edges of the glass and of the window opening (frame). Slip the glazing rubber moulding over the edges of the glass.

Insert a twine with a smooth surface or, preferably, a rubber insulated cable of 2.5 to 3 mm in diameter into the inner groove of the glazing rubber moulding.

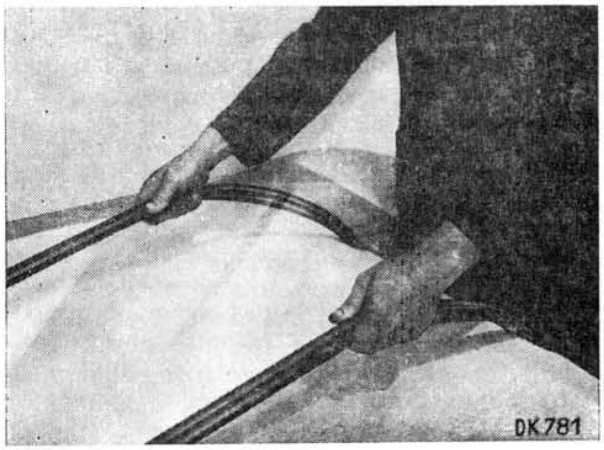


Fig. 14.6/1 - Fitting Glazing Rubber Moulding on a Glass Pane

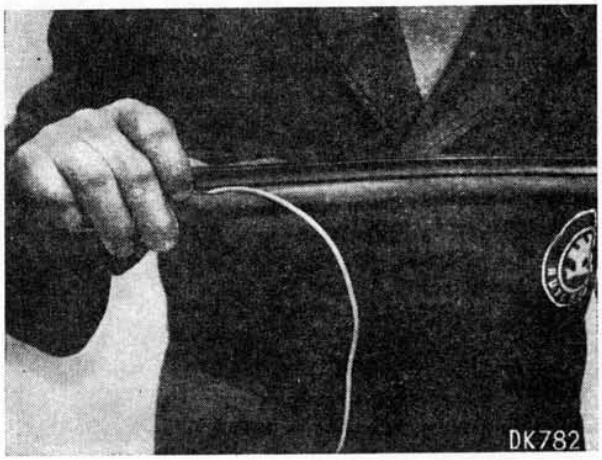


Fig. 14.6/2 - Inserting a Twine into the Groove of the Glazing Rubber Moulding

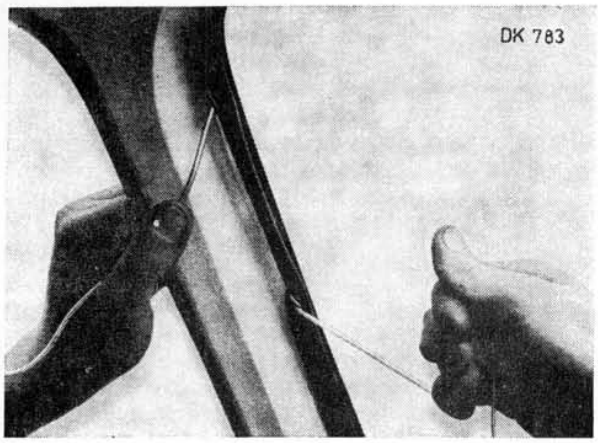


Fig. 14.6/3 - Slipping the Rubber Moulding Lip over the Edge of the Body Opening

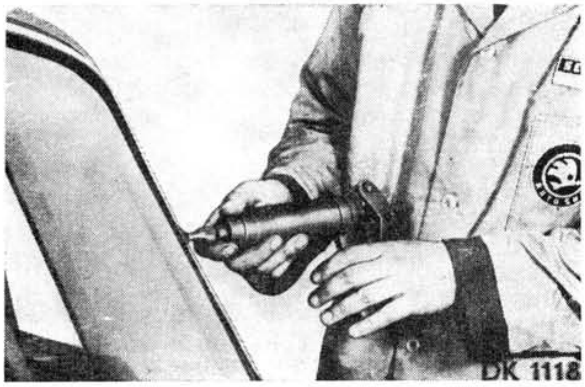


Fig. 14.6/4 - Application of Oil Varnish Using MP 8-101 Pump

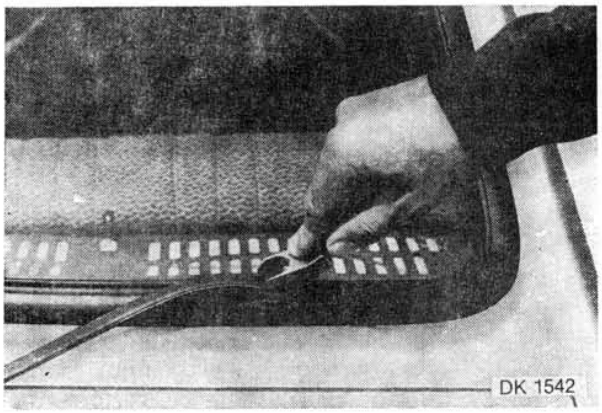


Fig. 14.6/5 - Inserting Spacing Insert with the Aid of MP8-161 Pack-in Device

Now press the glass with the glazing rubber moulding on to the respective opening of the body from outside. Get into the car and slip the lip of the rubber moulding step by step over the edge of the opening by withdrawing gradually the cable from the groove.

Make the windscreen and rear window weathertight by forcing oil varnish between the rubber moulding and the glass with the use of the MP 8-101 pump.

Insert the spacing insert into the glazing rubber moulding with the aid of the MP 8-161 pack-in device and cover the joining gap with the connecting piece.

To Remove, Reinstall, and Adjust Door Windows

First of all, remove the door trimming and then wind up the window as far as it will go. Remove the screw fastening the shorter guide-rail, press out the weatherstrip, and lift away the guiderail (the shorter guiderail is removable only from the front doors). Proceed to remove the bolts and the nut (the nut is in the door cavity) of the centre post. Lower the window and disengage the winder from the channel supporting the glass. Now lower the glass as far as possible and press it out of its guiderail in the centre post.

Press out the weatherstrip (interrupted) from the door frame in the upper part of the centre post, and then swing out and remove the centre post. Withdraw the glass with its supporting channel through the door frame. The window winder can be lifted away after removing its hold-down nuts.

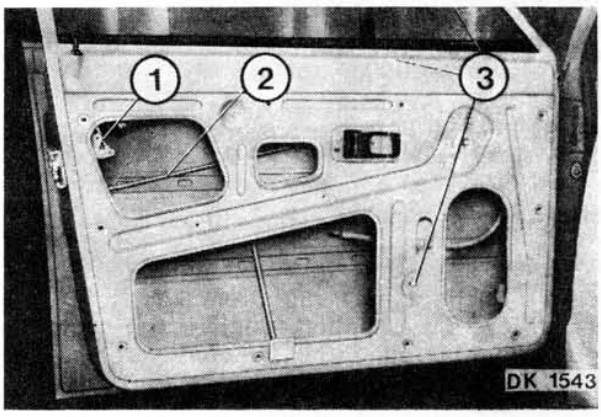


Fig. 14.6/6 - Front Door Control Linkage and Fastening/Adjusting Screws

1 - Inner latch control link (pull rod)
2 - Inner handle pull rod
3 - Fastening/adjusting screws and nuts of the centre post
(third screw in upper part of centre post)

Reverse the dismantling procedure to reinstall the window and its winder. The lateral play can be adjusted by adjusting (swinging out) the centre post after having loosened the respective bolts and nuts - see Fig. 14.6/6 and/or 14.6/7.

Use this occasion to lubricate inner door mechanisms - see Chapter 15.12.

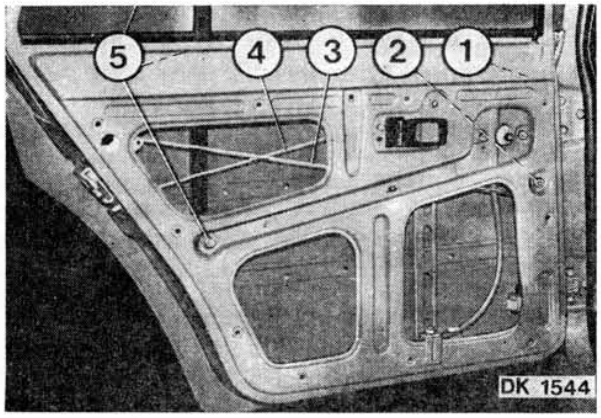


Fig. 14.6/7 - Rear Door Control Linkage and Fastening/Adjusting Screws

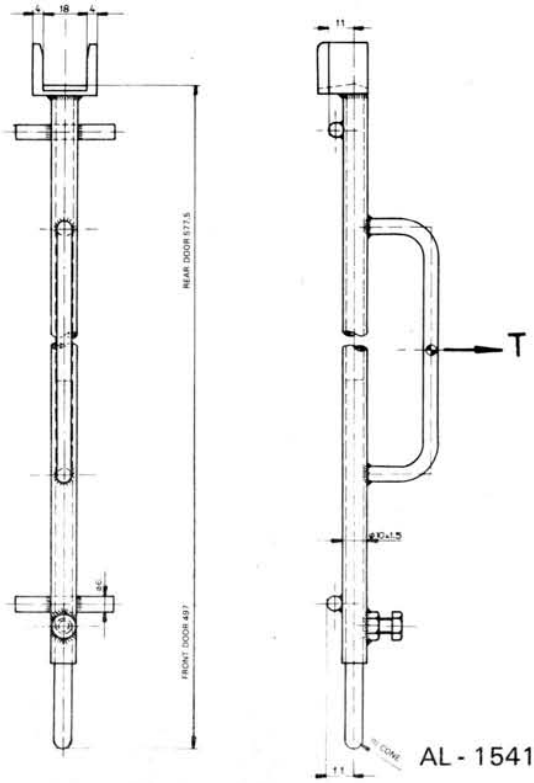
1 - Inner latch control link (short)
2 - Relay lever
3 - Inner latch control link (long)
4 - Inner handle pull rod
5 - Fastening/adjusting screws and nuts of the centre post
(third screw in upper part of centre post)

Repair of Window Regulator Defects

If the windows are difficult to wind up and down (the maximum torque applied on the spindle of the window regulator with the glass installed in the doors exceeds 2.5 Nm) (1.77 ft lbs), it is recommended that the following steps are taken as regards both the front and rear doors:

1. Disconnect the regulator driving plate from the window glass channel. Push the glass upward and try the relieved regulator by turning the regulator crank. If the regulator does not work smoothly (jamming, rattling) or if a torque higher than 0.7 Nm/(0.495 ft lbs) in front and 1.1 Nm/(0.78 ft lbs) in the rear is required for its operation, replace the whole regulator with a new one working satisfactorily.

2. Adjust the centre pillar position in the door using the jig as per drawing No. A1-15417-S. Loosen the top screw of the centre pillar and retighten it while pressing the centre pillar against the window glass wound up to its uppermost position. Loosen the bottom screw of the centre pillar and retighten it while pressing the centre pillar against the window glass.



3. When bolting together the regulator driving plate with the window glass channel make sure that the holes in these two parts coincide along the whole length of the channel. If it is not so, move the channel into a satisfactory position.

4. If the regulator is not lubricated, lubricate the regulator cable in the tubing with grease and apply oil to the regulator crank spindle.

To Remove and Reinstall Rear Door Fixed Window

Again remove first the door trimming. The glass is only inserted into the door frame and supported by a bolted-down holder with a rubber packing piece. The glass can be moved in the door cavity and withdrawn through the door frame.

14.7 TRIMMING UPHOLSTERY AND WEATHERSTRIPS

Panel-type Trimming

This type of trimming is used for the doors - see Chapter 14.5, Fig. 14.5/1 - and for the front and rear window posts. Panel-type trimming fastened by clips (flexible spacing pins) covers also the parcel tray below the rear window, the outer guiderails of the front seats, the front wheel arches, and the facia. On centre posts, the trimming is fastened by screws.

Glued-on Trimming

With the exception of the mentioned panel trimmings and the detachable ceiling lining, all coverings are glued on by means of various adhesives based on rubber. The glueing-on method depends on the kind of the adhesive. It is the general practice to let the adhesive dry partially on the surfaces which have to be covered by the covering (trimming).

Ceiling Lining - Removal

The ceiling lining is of plastic leather with five sewn-in pockets for the fastening bows. The roof bottom side (under the lining) is provided with a stuck-on heat and noise insulation. First remove the windscreen and rear window glass with the glazing rubber moulding, the inner finishing moulding of the front and rear doors, the courtesy lights, the sun visors, the interior rear-view mirror, and the hand grips with coat hangers. Now remove the trimming panels of the front, centre, and rear posts, unstick carefully the ceiling lining along its entire circumference, and push out the fastening bows through the side holes. In this way, the entire ceiling lining is free to be removed.

Ceiling Lining - Reinstallation

Make sure that the ends of the fastening bows are provided with metal and rubber packing pieces. Use petrol to remove the old adhesive from the body where the ceiling lining has been stuck on, apply the new adhesive and let it dry for several minutes. Apply also adhesive to the edge of the ceiling lining in a strip some 60 mm wide along the entire circumference and let it also dry for several minutes. Thread the ends of the fastening bows through the side holes proceeding from the rear to the front. Now start stretching the lining first longitudinally, fasten it at the windscreen and the rear window by removable clips, fold it over the moulded edge of the window opening so that it protrudes some 6 mm on the outer side and glue it on thoroughly. Cut and clean off the overhanging edges. Then proceed by reversing the order of the ceiling lining removal.

When glueing on new sealing strips, clean thoroughly the contact surfaces of the body before applying the new adhesive. Use only water and soap to wash the ceiling lining.

Weatherstrips

No special instructions are required for inserting or cementing conventional weatherstrips in their respective places. The sides and the tops of the door frames are, however, provided with special hose-type seals held in by special mouldings with an internal steel structure. To fasten these mouldings, compress their sides with pliers. When removing the moulding, proceed very carefully so as not to distort it, especially in the bends. Otherwise it will not be possible to reuse it.

Additional Weather Sealing

To seal up mating surfaces against the penetration of water, etc., use only special cements of permanent plasticity which will prevent their cracking due to a movement (vibration, etc.) of the joined surfaces.

One of such cements or sealing compounds is, for example, Chemiplast or Matadorplast. Joints of the underbody can be sealed with some of the damping compounds - see Chapter 14.9.

14.8 SEATS

Removal

a) of front seats
Remove the screws in the front part of each guiderail. Slide the seat to its foremost position, remove screws from the rear part of each guiderail, and lift away the seat.

b) of rear seats
Remove the bolts under the edge of the cushion and remove the seat cushion to gain access to the screws in the lower part of the backrest. Remove these screws, release the catch, and lift away the backrest. When reinstalling the backrest, tighten the screws only after having locked the backrest in position by means of the catch.

14.9 VARNISHES AND PAINTS

Bodywork Finish

The bodywork is finished in baking paints with a baking temperature from 85 °C to 110 °C. Three layers are applied - the priming coat, the grinding filler, and the top-coat varnish. The underbody is coated with a special protective compound.

Care of the Bodywork Finish

Never rub the car down with a dry or wet rag, sponge, etc. without using water. Road dust and mud particles act as an abrasive. Therefore hose down the car and only then use a brush or a sponge to remove sticking dirt. Hose down

the places from which you have removed the sticking dirt again, and wipe the entire bodywork dry, including chromium-plated parts, with chamois leather. Wash and wipe dry the varnished surfaces with uniform strokes in one direction, i.e. not by circular movements.

After having wiped all varnished parts of the bodywork dry, polish them with a soft (flannel) duster. Do not use polish of any kind.

If the bodywork is so dirty that it cannot be washed clean with water, use car shampoo.

If it is necessary to refreshen the gloss of the finish, use a car polish according to instructions of its manufacturer.

To wash the underbody, use a hose and running water, warm or cold; never use petrol, kerosene, diesel oil, etc.

Remove grease spots with a cloth, dry or soaked in petrol if necessary. To remove tar, dip the cloth in kerosene or a special tar removing preparation, and rub the spots. Then immediately wash away all traces of kerosene or the tar removing solution, and repolish the spots with a car polish.

TOUCHING-UP VARNISH

Preparation:

Removal of Polishes etc.

When touching up a repaired bodywork (damaged surface finish), it is important to also clean the surrounding varnish to prevent the touching-up paint from flaking off later on in places of overlapping.

Remove car polishes with a shampoo. Silicone oil, contained in some brands of polishes and preventing the adhesion of the touching-up paint, can be washed away only with a special preparation. In Czechoslovakia, this is for example VENEDIN. Rub with this preparation also varnished areas which will be roughened by grinding where the bare places pass into ground and cemented areas.

Removal of Rust

Remove rust mechanically by grinding or rubbing with emery paper and washing with a derusting agent (for example SK 2, which is basically a 30 % phosphoric acid).

Procedure: first clean the rusty spot with emery paper No. 80 and 100 or using a grinder. Then rub the spot with a 15 % solution of phosphoric acid (SK 2 deruster) heated up to 40 °C. When using a cold solution, its concentration must be about 30 % (undiluted SK 2 deruster). Work in rubber gloves.

After having removed the rust, wash the spot twice. First with tepid or cold water, soft or softened by adding 2 to 2.5 % of soda, then with a solution of chromium trioxide (1 gr. to 1 litre of soft water) heated up to 80 °C (this is the so-called passivating rinse). Now let the spot dry.

Degreasing

Degrease the spot to be touched up by rubbing it down with trichloroethylene or technical petrol.

1. Touching-up with low-baking paints – the most perfect procedure

a) Clean the touched-up spot, derust and degrease it (see the previous paragraphs on preparation)
b) Spray over with priming paint
c) Let the priming paint dry at 80 °C to 110 °C for a period of 50 or 15 minutes (50 minutes at 85 °C, 15 minutes at 110 °C)
d) Coat over with synthetic cement or polyester cement
e) Let the cement dry at 85 °C or 110 °C for a period of 50 or 15 minutes respectively; when using polyester cement, the drying period can be shortened – this cement dries at normal temperature
f) Grind under water with emery paper No. 280 to 320 till the spot is perfectly flat and even, and let it dry
g) Spray with top-coat varnish
h) Let it dry at 80 °C to 110 °C for a period of 15 or 50 minutes respectively; after baking, the varnish has a high gloss and it is not necessary to polish it
i) Use a polish to remove any visible traces of transition between the original and the new varnish.

2. Touching-up with nitro-combination varnish

a) Clean, grind, derust, and degrease the spot to be touched up
b) Apply priming paint with a brush or a spray-gun
c) Level up, if necessary, with an oil-base cement (once or twice)
d) Let it dry for 24 hours and then grind with emery paper No. 220
e) Spray the entire touched-up area with spraying cement and let it dry for 24 hours
f) Grind with emery paper No. 280 and 320 under water till the area is perfectly smooth and flat, and let it dry
g) Spray the touched-up spot with a varnish prepared by mixing low-baking varnish (70 %) and touching-up varnish (30 %); use exclusively a nitro-thinner for diluting the varnish

h) If it is necessary to polish the touched-up spot, use a polishing compound, but only after the varnish has perfectly hardened (preferably the next day).

3. Touching-up with nitrocellulose lacquer

Proceed according to points a) to f) above

i) Spray nitrocellulose lacquer on the touched-up spot

j) After drying, polish the touched-up spot with a polishing compound and give it a high gloss with a polish.

PAINTS AND PROTECTIVE COMPOUNDS

The car underbody is protected with a coating of a protective compound (PVC - Plastisol). For touching up, use any compound made for this purpose.

If the protective compound or priming coat is damaged through whatever agency, repair the damage by removing grease and rust from the respective area and by coating the bare metal with paint.

Apply the protective compound only after the paint has dried. The drying period of the synthetic priming paint (S 2000) is 24 hours, of oil paints even longer.

14.10 CHECKING UNDERBODY DIMENSIONS

Check gauges MP 8-159 and MP 8-160 have been designed to facilitate this measuring.

The MP 8-159 gauge is used for measuring mounting holes of the front axle, the MP 8-160 gauge for measuring mounting holes of the rear axle radius arms, and the engine and gearbox cross bearers. All measurings are carried out from the centre checking holes.

If the gauges are not available, refer to measures given in Fig. 14.10/1.

14.11 SEAT BELTS

Seat belts for the front seat and for the rear outside seats are anchored at three points, the seat belt for the person in the middle rear seat

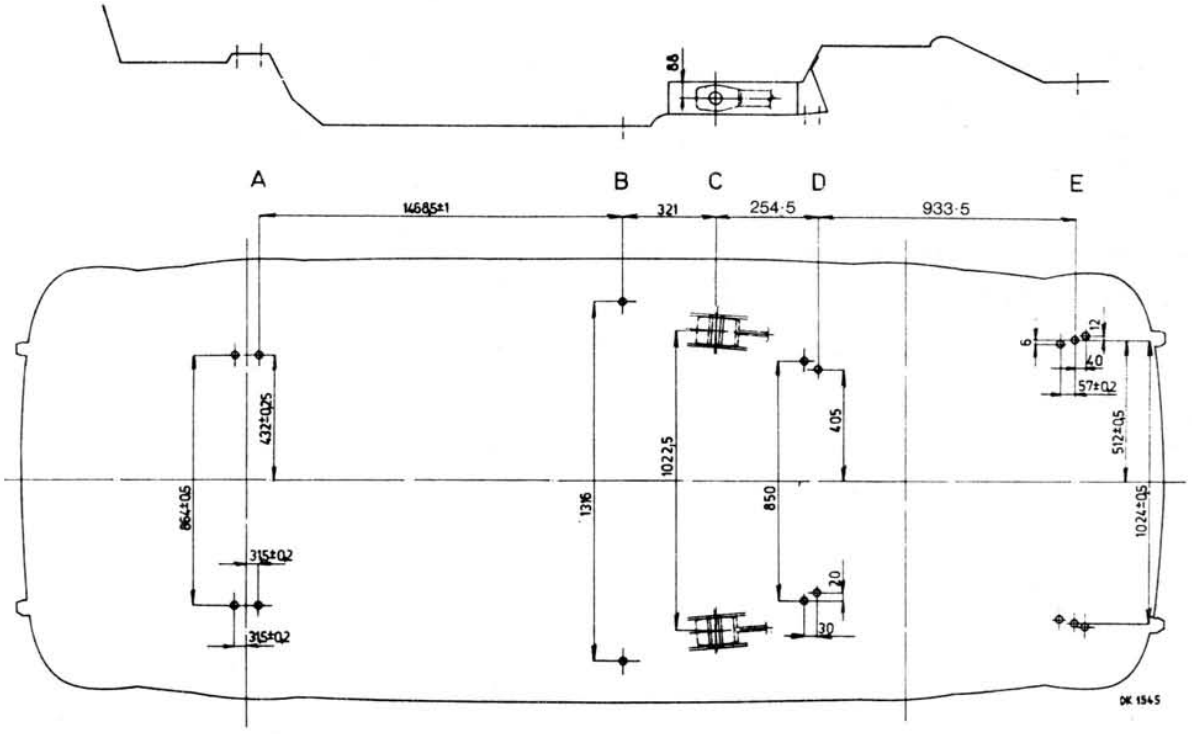


Fig. 14.10/1 - Mounting Holes of Car Underbody

A - Front axle holes, B - Checking holes, C - Holes of rear axle radius arm (this arm is drawn for information), D - Holes of gearbox cross bearer, E - Holes of engine cross bearer

has two anchoring points. The seat belts have anchoring bolts on the size 7/16-20 UNF-2A.

In front, the anchoring threads are easily accessible being provided on the door posts (remove only one of the pair of pins covering the thread), on sills below the posts, and on the sides of the floor tunnel behind the front seats.

Anchoring points for rear seat belts are shown in the illustation. For the seat belt of the person sitting in the middle, the threads are under the seat cushions and rather removed from each other (A3). For the seat belts of persons occupying the outside places the threads are also under the cushions, nearer to the centre (A2), in the body sides close to the cusions (B2), and in window pillars (C2). These latter threads can be found by touch in the point of intersection of the plane passing about 165 mm above the rear window parcel tray and in parallel with the door frame at a distance of about 85 mm. To gain access to them, it is necessary to cut through the trimming.

We must stress that for the fitting of points A2 and A3, the bolts should not protrude beyond the

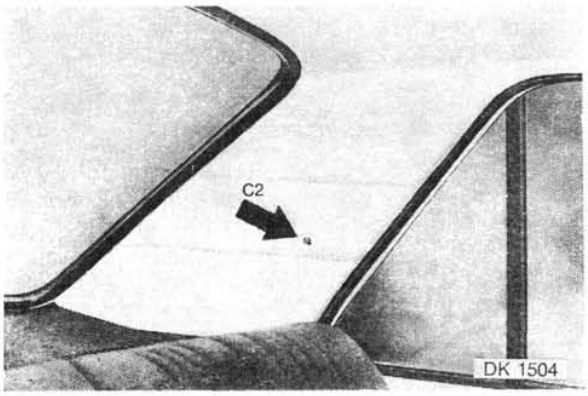


Fig. 14.11/1 - Upper Anchoring Point

captive not more than 1½ mm or there is every likelihood of damaging the fuel tank.

The depth of the nut from the mounting face is 15 mm.

Child seat fixing

Follow the seat belt manufacturers instructions as to the spacing of the belt straps.

The straps can be mounted to the rear parcel shelf if the mounting holes are drilled 30 mm from the front engine bulkhead. The sound deadening trim in the engine compartment will need to be lowered to fit the spreading plate and nut.

Be careful when drilling the shelf, not to scratch the rear screen.

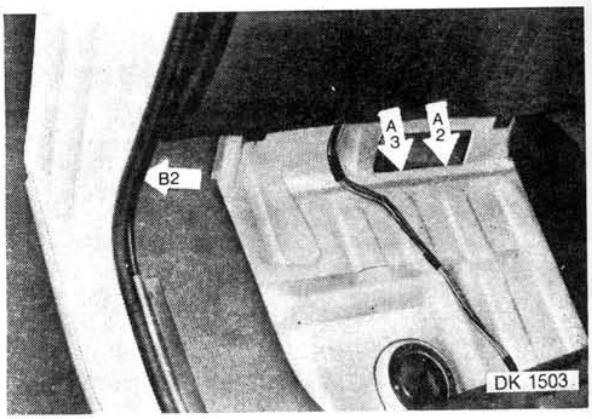


Fig. 14.11/2 - Lower Anchoring Points

14.12 FACIA

The facia can be removed after unscrewing the nuts of its peripheral bolts and after lifting away the instrument panel - see Chapter 13.15. It is also necessary to remove the steering wheel with the shroud of the steering wheel shaft (see Chapters 7.7 and 7.8), and the heater control panel (see Chapter 11.0).

The bolts holding down the facia are accessible after removing the instrument panel and the heater control panel, and after swinging out the glove box. To swing out the glove box, open its lid and loosen the screws of its stops.

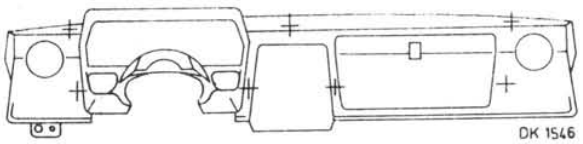


Fig. 14.12/1 - Facia Mounting Points

14.13 WATER LEAKS

To determine the source of a water leak proceed in a progressive manner.

1. Determine area water finally rests.
2. If possible follow water trace to source.
3. If not, remove carpets and clutter.
4. Dry car inside and out.
5. Use a sprinkler rather than a hose jet.
6. Start on the underside of the vehicle and work up. Do not do any adjustments or sealing until after the first test.
7. When you have finished adjustments and sealing RE TEST.

14.13.1 WATER LEAKS INTO BONNET AREA

1. Flange Leak.

a) Dry and clear out the luggage boot space.
b) With bonnet open or removed.
c) Start at the front of the vehicle, with small continuous water supply from a hose, direct the water into rain channel. When water appears in the bonnet and the trail disappears behind the side brackets on which the hinges and bonnet locks mount, the area to be sealed is determined. Either the wing flange or the retaining bolts or both in this area should be Sealed.
Botls – by removal painting with sealant, also coat washers and refit.
Flange – By painting Sealant over flange. Attempts to remove the wing panel may result in the panel being damaged due to the original type of Sealant used.
d) Spray water under the front wing panel at the wing to body joint as this seam has two seams. (Is the water dirty? If it is, it will normally be from under the vehicle.

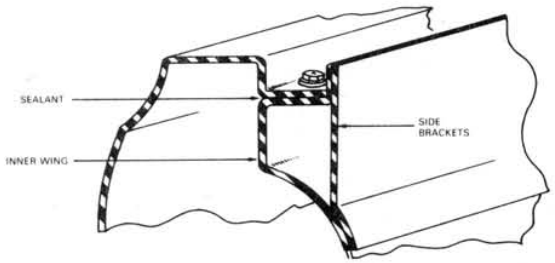


Fig. 14.13/1

2. Bonnet Weatherstrip Leak.

a) Small person inside front bonnet with wax chalk.
b) With bonnet closed.
c) Person inside is to look for light gaps between the bonnet and weatherstrip and mark areas with chalk.
d) Adjust the weatherstrip to eliminate light gaps. Refer to section 4.
e) Repeat (a) to (d) but at the same time sprinkle water over the bonnet edges. Do not forget that when moving the airstream makes the water drops flow in all directions.
f) When no more ingress of water from the weatherstrip is present proceed.

3. Lock Catches and Bonnet Hinge Leaks.

a) When completing 2e it may be noted that water drips from the lock catches and bonnet hinges, if this is so, open the bonnet and examine the bonnet structure for signs of water.
b) The areas to be sealed are shown in the diagram below.

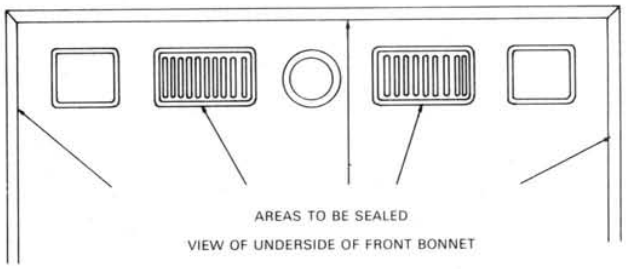


Fig. 14.13/2

4. Bonnet Weatherstrip and flange.

a) Ensure the strip stands upright.
b) Ensure the weatherstrip is not strained on the corners. The flange on which the strip sits should be as thin as reasonably practical particularly in the corners.

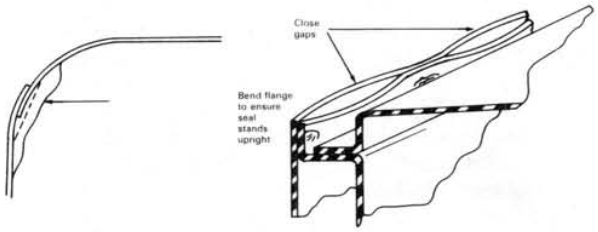


Fig. 14.13/3

c) The flange should be vertical and change smoothly from one height to another.
d) The seal should be pressed and deflectd (1) but not compressed (2).

Fig. 14.13/4

5. Master Cylinder Cover.

Water may enter the bonnet area through the retaining clip boots. If it does replace them and ensure watertight seal.

After repositioning and refitting all components, CHECK FOR LEAKS only when water no longer enters is the Job completed.

14.13.2 WATER LEAKS INTO THE PASSENGER COMPARTMENT

1. INGRESS OF WATER FROM THE FRESH AIR BOX

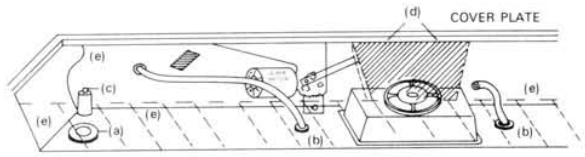


Fig. 14/13.5

a) **Box drain tubes** (One either side of car) Pt No. 113-790970 if perished replace, sealing rubber to metal with clear mastic.
b) **Heater bleed tube/speedometer cable grommets.** It is suggested that the original grommets are replaced with domed grommet Pt No. 113-793801.

Fig. 14.13/6

The dome should stand up in the airbox and should be partially filled from inside with Dum Dum.
The grommet should be sealed to the body using clear mastic.
d) **Jack socket.** Seal the terminal base using Dum Dum. The base sockets should be sealed with clear mastic.
d) **Water entering through Centre of heater.** The cover plate over heater, motor fan if it is not fully butted against the shuttle (ie. a gap) seal with
e) **Body joints inside airbox to inner wing.** Ensure sealant covers all joints up to the under side of the scuttle panel.

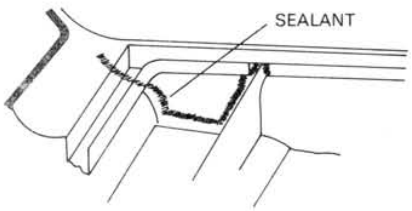


Fig. 14.13/7

2. WINDSCREENS

Windscreen sealing is in fact sealing two joints and they should be treated in different ways and as separate joints.

1. Glass to Gasket.
2. Gasket to body.

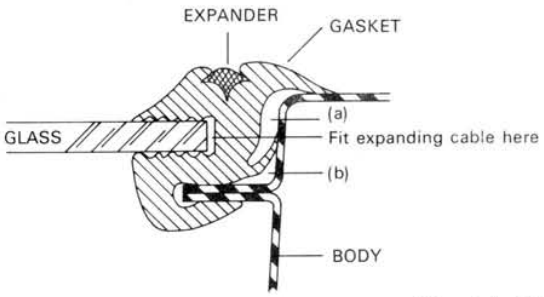


Fig. 14.13/8

1. The joint between the screen and the rubber is sometimes factory sealed with a sealant varnish which hardens and when disturbed shatters; and this in turn allows passages for water from outside to the interior. Application of glass mastic sealer will drive out the water and seal the joint. If, however, this is not achieved it will be necessary to remove the rubber and clean the seal faces and the glass in order to ensure that the joint can be made.

The expander of the 105/120 range should be fitted to the rubber after fitting the glass and rubber to the body using special tool MP8-161.

Carefully fit the rubber to the glass, stretching it evenly around the whole glass and not stretched over the last side/corner to be fitted.

After fitting the screen/rubber assembly, ensure that the glass is centralised in the aperture.

The expander can now be fitted using MP8-161 expander fitting tool.

2. The second joint is between the rubber and the body. We must stress that there are two areas of this joint, one (a) is a water drain channel and the second (b) serves two duties of holding the glass in the aperture and stopping the ingress of water into the passenger compartments.

The water drain channel must not be filled with any sealant and the drain holes at the base of the aperture should be free of obstruction.

The water sealing properties of the joint can be re-inforced by the application of mastic sealant into the joint (b) shown in the diagram.

Test for water leaks

Spray water onto and around screen being tested, lingering a long time in all positions, to ascertain the point of entry. Determine it is coming from the glass rubber seal or the rubber body seal then correct the leakage.

Other causes

1. Malforming of frame. Straighten frame and smooth contours ensuring that the lip is not deflected and uneven.

2. Weld spots, remove excess metal and make good paintwork.

3. Excessive aperture size, increase size of glass (ie. by inserting thin plastic tube or single/double flex between glass and rubber). This can be done by first removing expander, inserting thin tube and sealant and then refitting expander, use Special Tool MP8-161 or similar.

3. DOORS

One person inside vehicle.

One person spraying vehicle.

Watch for signs of water ingress into the vehicle including around glass seals starting at bottom, but do not worry too much.

Mark places of ingress on each door.

PLACES

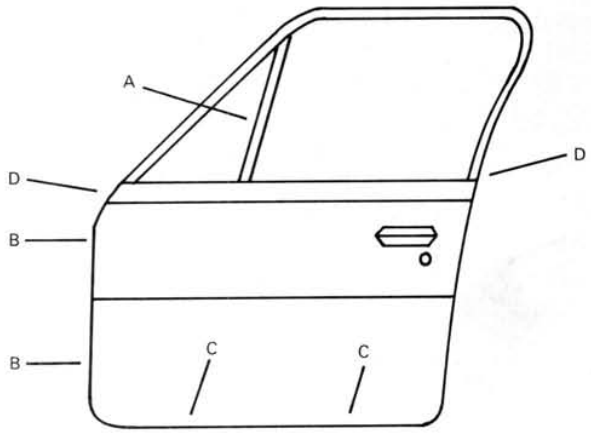


Fig. 14.13/9

a) Leaks around the quarter light seal indicates incorrect positioning of the glass or seal. Remove door trim and slacken retaining (44). The glass can now be removed and the seals (53 and 55) checked for damage and dirt. Correctly position seal (53) in the frame, and seal (55) to the glass in seal (53), and then fit/adjust rod runner (44). When tightening the centre retaining nut (42) squeeze together the inner and outer halves of the door. Ensure a pad of rubber is placed above the centre and retaining screw to hold the glass in position.

Note: Fig. 14.13/10 (Front Door Components) on following page.

Ensure the moving glass still slides smoothly, refit the plastic water shield before fitting the door trims. Ensure the extra drip flaps on the plastic shield enter the access holes in the door panel.

b) The door hinge is fitted with 3 bolts, the single bolt next to the seal tends to stand out so causing the seal to be squashed. Removing the spring washer alleviates the problem although in a very few cases both washers have to be removed.

c) Water entering the vehicle along the bottom seal often indicates an incorrectly adjusted door, the reason is that the seal is excessively compressed. This in turn will not allow the water to run out of the drain slots in the rubber.

d) At points D Fig. where the glass frame meets the door body there can be a weld bump which causes a gap on the seal. In some cases it will require the use of a file to remove excess metal, in other cases it will only require the adjustment of the door flange.
It is necessary to carefully check the door frame flange to ensure that the seal has an even fit all round the door, bending this flange so that it changes direction in a smooth fashion.
Ensure that there are no openings on the flanges between spot welds as these may cause the seal to seat badly on the frame.
Adjust the doors so that seals are not excessively compressed.

Fig. 14.13/11

Ensure that where the seal goes around bends that it does so smoothly and is not distorted.

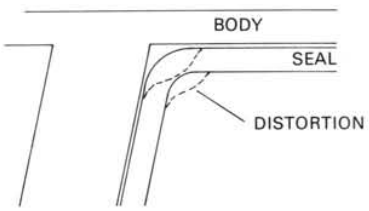
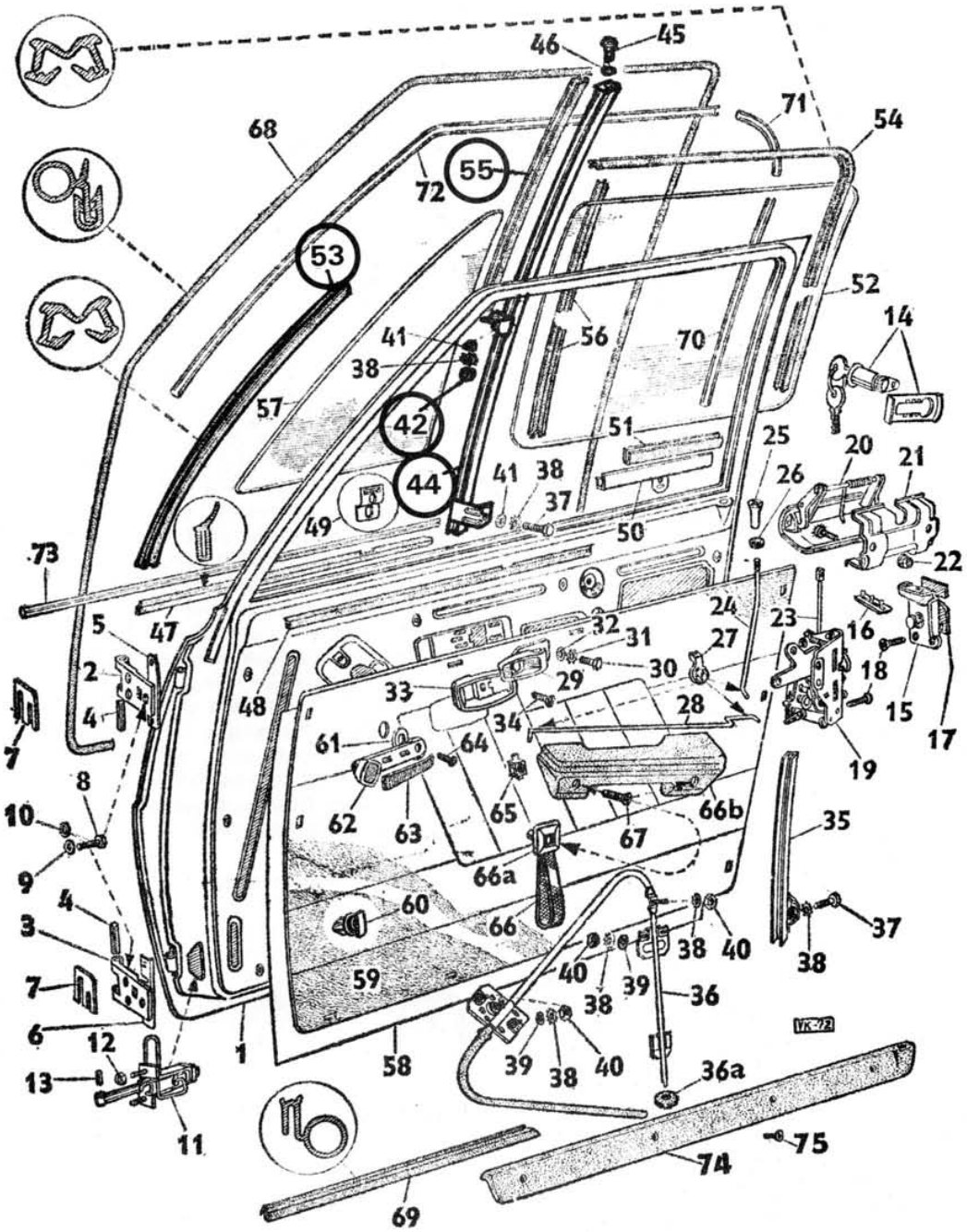


Fig. 14.13/12



Front Door Components Fig. 14.13/10

15 - MAINTENANCE

15.1 GENERAL INFORMATION

For maintenance instructions concerning the individual car components refer to Chapters 15.3 through to 15.13.

MAINTENANCE IN DEPENDENCE ON THE NUMBER OF KILOMETRES TRAVELLED

The individual maintenance jobs are specified individually in the Service Voucher Book handed over to the buyer of the car with the other car documents. The car owner or user presents this Voucher Book for signature in the service station to which he brings his car for servicing.

Maintenance jobs listed in the Voucher Book are, moreover, supplemented with servicing jobs depending on time intervals as specified below.

MAINTENANCE JOBS DEPENDING ON TIME INTERVALS ETC.

complementing maintenance depending on the number of kilometres travelled:

1. **About every month**

— Check electrolyte level and top up if necessary

2. **About every six month or whenever necessary**

— lubricate the accelerator mechanism
— lubricate the distributor
— lubricate door, boot lid, and engine bonnet hinges and locks, and the spare wheel carrier

3. **About every year**

— change the engine oil
— check the grease packing of front wheel bearings, repack the bearings with grease if necessary

4. **About every two years**

— lubricate the joint of the windscreen wiper leverage
— top up oil in the steering box

5. **After about three years**

— change oil in the gearbox/final drive housing
— pack front wheel bearings with fresh grease

6. **Before and after the winter season**

— lubricate front axle pins
— clean dust boots of front wheel cylinder pistons and inspect them for intactness

7. **Sparking plugs**

Kilometres (15,000 to 20,000) should be counted always from the last replacement of the sparking plugs

Other Recommended Maintenance Jobs and Equipment

- Change of brake fluid after two to three years.
- Change of coolant after two to three years.
- Change of all rubber parts of the hydraulic brake system and clutch release system after five years or 100,000 kilometres if they have been travelled sooner.
- Brake booster efficiency check (with ŠKODA 120 LS) after 50,000 kilometres or two years.
- Grease gun (for lubrication of king pins) developing a pressure of at least 300 atmospheres, for example the MOA 2 lubricating set.

15.2 RECOMMENDED LUBRICANTS AND OTHER SERVICE FLUIDS

For oils, we indicate the internationally approved SAE classification (American Society of Automotive Engineers). According to this classification and the oil brand, it is possible to choose the correct oil of whatever provenience. We supplement our information with several brands of suitable oils of well known world producers, tested by the car manufacturer or specially recommended by oil producers.

The viscosity class of some of the oil brands is indicated either directly or by a general iden-

ENGINE OIL - HD detergent type

Lubricating point	Viscosity class	Ambient temperature
Engine	SAE 50	+15 to +50 °C
	SAE 40	+10 to +35 °C
	SAE 30	0 to +20 °C
	SAE 20W/20	−10 to +10 °C
	SAE 10W	−25 to + 5 °C
Distributor, clutch release bearing, and other oil-can lubricated points*	Oil of medium viscosity, i. e., covering SAE 20 W/20 or 30 class; oil brand is irrelevant	

* Engine bonnet and boot lid hinges and release mechanisms, door hinges, etc., sundry mechanisms

tification number, or in words. For example Mobiloil 30 is an oil in the SAE 30 viscosity class, Mobiloil Special belongs to the SAE 10 W/30 class. We quote the viscosity class symbol of oils identified in this way in brackets following the oil brand (trade name).

Oils designated by a doubled viscosity class symbol are the so-called multigrade oils. Their compliance with viscosity classification is expressed by the symbol before the fraction line progressively to the classification expressed by the symbol behind the fraction line. Thus, for instance, the SAE 10W/30 oil has the properties of the SAE 10 W, SAE 20 W/20, and SAE 30 class.

Czechoslovak oils

Motor oil M6 AD (SAE 30), M4 AD (SAE 20W/20), Mogul Super SAE 20W/50, Mogul Special SAE 20W/30
Madit Oil SAE 30 (M6 AD), Madit Oil SAE 20W/20 (M4 AD), Madit Oil Special SAE 10W/30, Madit Super SAE 10W/40

Foreign oils

Agip: Agip F. 1 Motor Oil HD SAE 10W/20, 20W/30, 40/50; Agip F. 1 Super Motoroil 10W/40, 20W/50
BP: Energol HD SAE 40, 30, 20W (20W/20), 10W; Super Visco-Static 10W/30, 10W/40, 20W/20
Castrol: Castrol 40, 30, 20 W/20, 10 W; Castrolite (SAE 10W/30), XL (SAE 20W/50); GTX (SAE 10W/50)
Mobil: Mobiloil 40, 30, 20W/20, 10W; Special (SAE 10W/30); Special 20W/50; Super (SAE 10W/50)
Shell: X-100 40, 30, 20W/20, 10W; Super (SAE 10W/50)
Other oils of foreign make can be used if equivalent to the listed brands, for example, Avia, Esso, Hena (Optimal LD), INA (Delta TLX), Naftagas (Galax GTX, Omnia) etc.

GEAR OILS - type E. P. (high-pressure)

Lubricating point	Viscosity class	Ambient temperature
Gearbox/final drive	SAE 140*)	+50 to +15 °C
	SAE 90	+35 to −15 °C
	SAE 80	+ 5 to −30 °C
Steering box	SAE 90	throughout the year

*) Not used in Czechoslovakia

Czechoslovak oils

PP 90 (SAE 90) gear oil; PP 80 (SAE 80) gear oil

Foreign oils

Agip: F. 1 Rotra 140; 85/90; 75W/80
BP: Gear Oil 140 EP; 90 EP; 80 EP
Castrol: Hypoy B 140; B 90; B 80
Mobil: Mobilube GX 140; GX 90; GX 80
Shell: Spirax E. P. 140; E. P. 90; E. P. 80 W
Other gear oils of foreign make can be used if equivalent to the listed oils.

SPECIAL OILS

Distributor bearings (service inspection)

Czechoslovak make - ON 1 low-pour-point oil
Foreign make - for example, Shell Clavus 17 and similar oils

GREASES - use throughout the year

Water pump

Czechoslovak make - SP 4 soap grease, NH 2 or A4 motor grease

Front wheel bearings, gear lever bracket

Czechoslovak make - SP 4 or NH 2 soap grease

King pins

Czechoslovak make - A 00 motor grease

Inner door mechanisms, locking mechanisms

Czechoslovak make - SP 2-3 soap grease*)

Clutch release bearing

Czechoslovak make - SP 4 or NH 2 soap grease*)

Steering linkage ball joints, crankshaft bearing

Greases listed in the paragraph on greases of foreign make

Greases of foreign make:

Agip: F.1 Grease 30; BP: Energrease L2; Castrol: Castrolease I. M.; INA: Automast Special; Mobil: Mobilgrease MP; Shell: Retimax A, and other greases equivalent to the listed ones.

BRAKE FLUID

To SAE J 1703 C Specification
In Czechoslovakia - SYNTOL HD 190 brake fluid
Abroad - SYNTOL HD 190, Pentosin Super Fluid, Mobil Hydraulic Brake Fluid, ATE Blau, BP Brake Fluid, STOP SP 19

*) Greases of foreign make should be preferred.

ANTIFREEZES (in Czechoslovakia), e.g.

FRIDEX Spolana into the radiator
GLACIDET into the windscreen washer

15.3 ENGINE AND ITS ACCESSORIES

Topping-up Oil and Checking Oil Level

Use the dipstick to check the oil level which should be just between the lines marking its minimum and maximum height. Top up the oil through the hole in the cylinder head cover after having removed the plug by rotating it anticlockwise.

Do not check the oil level immediately after a run or after filling. Give the oil time to flow down from the engine walls. When checking the oil level, the car should be placed on level ground.

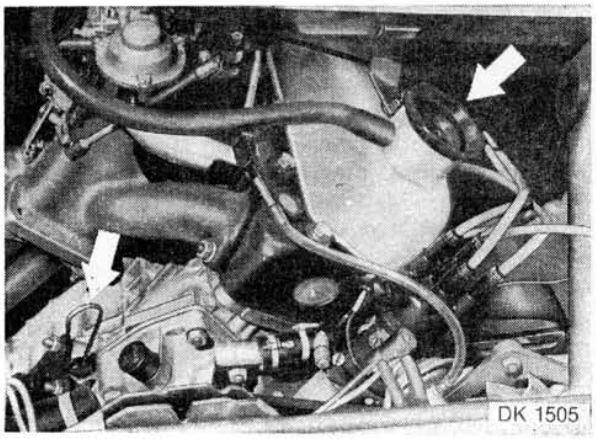


Fig. 15.3/1 - Oil Dipstick and Oil Filling Hole Plug

Oil Change

Remove the drain plug from the oil sump and let the oil flow out. Remove also the oil filter and clean its bowl and/or replace the filter element with a new one (depending on the number of kilometres travelled). After having reinstalled the oil sump drain plug and the oil filter, fill the engine with fresh oil. Run the engine for a short time (about half a minute) till the oil penetrates into all the oilways, let the oil level stabilize, and recheck it.

Note: If the sealing ring of the oil sump drain plug shows any signs of damage which is likely to result in leakage, replace it with a new one. Be careful no to strip the thread by over-tightening the plug when screwing it in (for its tightening torque see Chapter 1.8).

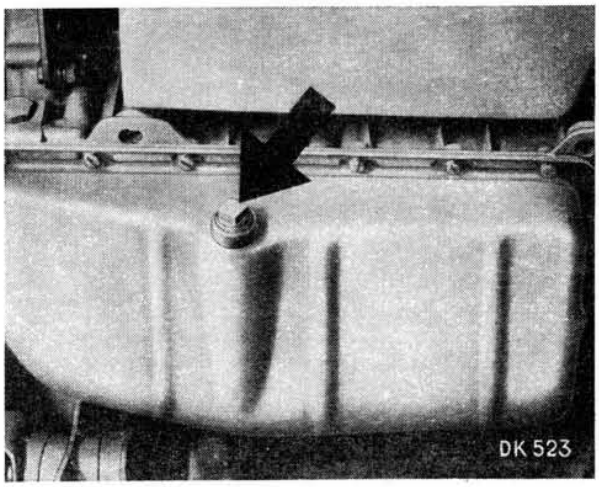


Fig. 15.3/2 - Oil Drain Plug

Before draining the oil from a cold engine, let the engine run for a short time to warm it up to enhance fluidity of the oil.

Renewal of Oil Filter Element

The oil filter element is installed in a cylindrical bowl on the right-hand side of the engine. Remove the centre bolt and lift away the bowl. With the bolt removed, the filter element is released and it can be withdrawn together with its spring from the bowl.

Clean the bowl and reinstall the bolt after having slippped on it the spring with the thrust plate facing outward and the new filter element. Do not forget to dip the sealing ring under the bolt head in oil before reinstalling the bolt. A dry sealing ring is subject to abrasive wear during the oil filter fastening.

Note: If the filter element is provided with an additional bottom seal in the plate (which is the case of some filter elements of foreign make), turn the element with this side toward the thrust plate with spring.

Place the assembled bowl on the mounting collar on the engine and tighten the bolt. Let the engine run while checking the oil filter mounting for leakage, then stop the engine and recheck the oil level after its stabilization.

The sealing ring under the bowl is of circular section. If it is distorted or otherwise damaged, use a new sealing ring. Examine also the sealing ring under the bolt head and renew it, if damaged.

Lubrication of Water Pump Bearings

Screw off the Stauffer lubricator cap, pack it with grease and screw down the cap to force

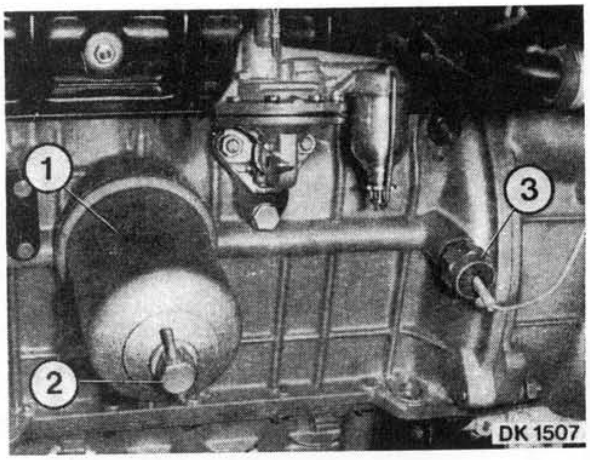


Fig. 15.3/3 - Oil Filter

1 - oil filter bowl with filter element
2 - centre-bolt
3 - oil pressure switch

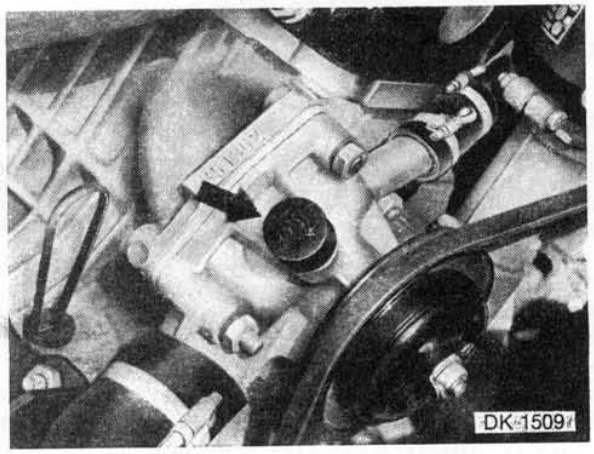


Fig. 15.3/4 - Lubricator of Water Pump Bearings

all the grease into the bearings. Tighten the cap thoroughly so that it cannot be worked loose by vibration.

Air Cleaner - cleaning and replacing of filter element

Unclasp the cover fastening clips and lift away the lid. Depress the cross brace in the jacket, rotate it slightly to disengage it, and withdraw the filter element. Wipe clean the inside of the jacket, clean the filter element or replace it with a new one, and reclose the air cleaner proceeding in reverse order.

Shake and tap the filter element to rid it of dirt particles, and blow it off and through with pressure air. When driving often on dusty roads, the cleaning intervals should be shortened by half.

For air cleaner maintenance in tropical regions refer to Chapter 16.2.

Air Cleaner - winter operation

Remove the rubber cap from the cover extension arm and use it to stop the mouth of the arm. Fit a guide extension into the cleared hole in the arm and insert the corrugated paper hose (included in the car equipment) into the extension and the holder on the intake and exhaust manifold.

Give the hose the required shape by bending it slowly and carefully. Above all, place it into the holder so that there is a sufficient distance (wide enough to insert a finger) between it and the exhaust manifold.

Tightening of cylinder head bolts

The cylinder head bolts should be tightened in the running-in period before the gasket gets settled and then after every replacement of the gasket, i.e., after about 1,000 kilometres. For the tightening procedure, see Chapter 2.16. **Checking of valve clearance after every tightening of the cylinder head is a routine procedure which must not be omitted.**

Valve Clearance

For checking procedures and adjusting values, refer to Chapter 2.13.

Alternator V-belt Tensioning

Loosen the nuts of the bolts in the alternator flange (fastening it to the engine and the strut) and of the bolts holding down the strut on the alternator, and swing aside (tip) the alternator.

Adjust the belt so that it gives way 10 to 15 mm midway between the belt pulleys when depressed lightly (as if a weight of about 2 kg were applied) with the finger at this point. Lock the alternator in this position by tightening properly all the nuts.

Belt dimensions: 9×9.5×1,000 mm.

To Clean the Distributor

The contact breaker points, the cover, and the rotor arm of the distributor must never be greasy or dirty. Scrape off any burns on the distributor cover.

If you have cleaned the distributor with petrol, do not refit the cover till after the petrol has completely evaporated.

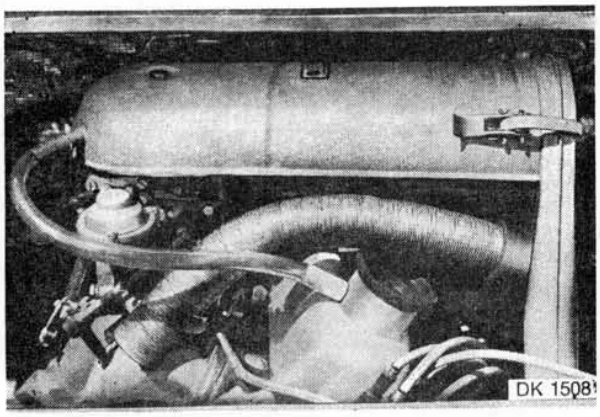


Fig. 15.3/5 - Air Cleaner Cover Fastening Clips and Hose for Winter Operation

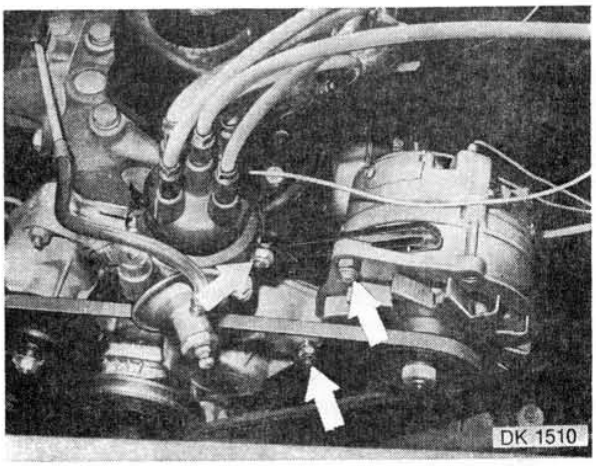


Fig. 15.3/6 - Alternator Hold-down Bolts

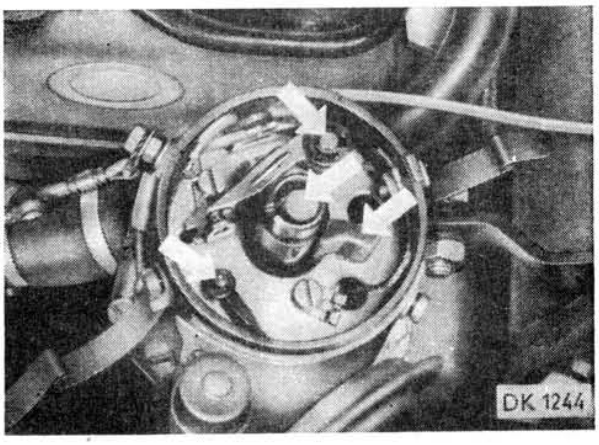


Fig. 15.3/7 - Distributor Lubricating Points

To Lubricate the Distributor

Remove the distributor cover and the rotor arm, and drip so much oil on the felt sliding along the cam and the felt inside the cam, as the felt will hold. Coat sparingly with oil (one drop) the rotor spindle and the pin of the vacuum control link. These points, including the felt sliding along the cam, can also be lubricated with grease - see Chapter 15.2 - Greases of Foreign Make (Shell Retinax A, etc.) or with Ciatim 201 grease.

Lubricate the centrifugal timing control in the distributor housing with four to five drops of oil applied through the hole in the contact breaker plate (surplus oil will flow out through the hole in the distributor bottom).

Following a repair or a service inspection, remove the bolt from the bottom of the distributor housing and drip a special low pour-point oil on to the self-lubricating bearing (refer to Chapter 15.2 - Special Oils).

Adjusting Contact Breaker Point Gap

Remove the distributor cover and, if necessary, the rotor arm, and turn the engine to the full lift of the distributor shaft cam. Refer to Chapter 13.5 for the correct gap between the contact breaker points, and adjust the gap by moving the contact holder after loosening the hold-down capscrew. See Chapter 13.5 for angular check of the opening of the contacts.

Adjustment of Basic Ignition Advance
Basic Setting Values (measured on crankshaft)

ŠKODA 105 S and 105 L	3°±2°
ŠKODA 120 L and 120 LS	5°±2°

a) Adjusting procedure without aids:

1. Turn the engine (crankshaft) so that the timing mark on the crankshaft belt pulley is set opposite to the timing mark on the timing gear cover to the value of the required advance.

2. Loosen the clamping bolt holding the distributor in its bracket and switch on the ignition.

3. Pull the centre cable out of the distributor cover (H.T. lead from ignition coil) and hold the end of the cable at a distance of 3 to 5 mm from the cylinder block or another engine part connected conductively with the block. Rotate the distributor clockwise and return it slowly. The position of the distributor corresponding to the set advance is identified by the spark-over from the cable to the engine. Secure the distributor in this position by tightening the clamping bolt.

For turning the engine, use a spanner applied to the head of the crankshaft belt pulley bolt.

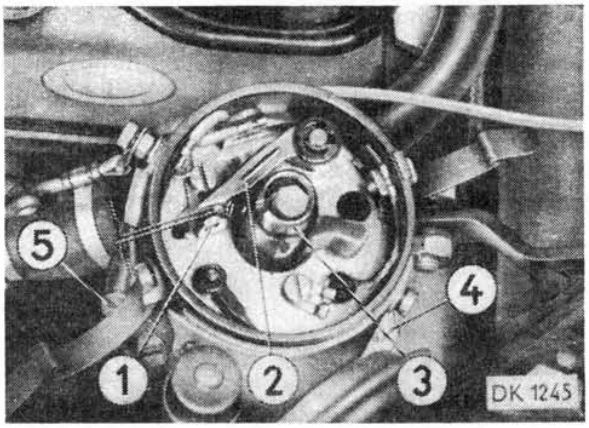


Fig. 15.3/8 - Distributor Adjusting Elements
1 - contact holder, 2 - rotor arm, 3 - cam,
4 - distributor bracket, 5 - distributor bracket clamping bolt

Always turn the engine clockwise to eliminate any play in the distributor drive gear and to avoid loosening of the bolt. To relieve the compression resistance, it is recommended to back off the sparking plugs.

b) Stroboscopic method:

When using this method, the values of the basic ignition timing and the advance controlled by the centrifugal timing control (for its diagram refer to Chapter 13.5) should be added up while multiplying by two the added up values according to the diagram. Any effect of the vacuum control must be eliminated by disconnecting the respective hose (connecting the distributor vacuum unit with the carburettor). The measuring procedure is indicated by the diagnostic equipment itself.

To Adjust Idling Speed

Use the air-correction screw (speed correction screw). The speed decreases when rotating the screw clockwise and increases when rotating it anticlockwise.

Adjust the idling speed in accordance with the tachometer and within the limits specified in the following paragraph "To Adjust Idle Run". The engine must be warmed-up before starting the adjusting procedure (see also the following paragraphs) and its ignition must be in perfect condition (distributor contact-breaker points, sparking plug electrodes, and ignition advance).

Note: For the basic position of the adjusting screw refer to Chapter 2.19 - "Maintenance and Adjusting".

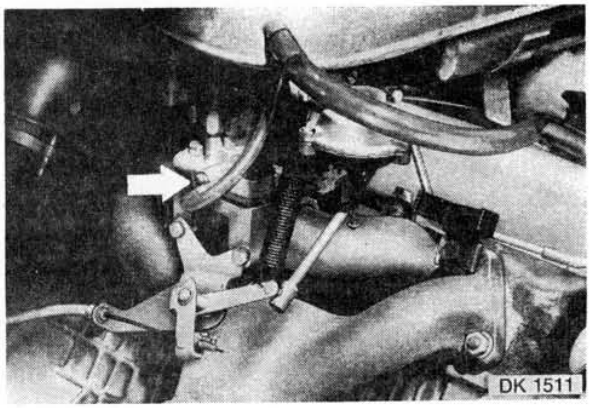


Fig. 15.3/9 - Air-correction Screw - idling speed correction screw

To Adjust Idle Run

Adjust the contact-breaker point gap, the gap of the sparking plug electrodes, and the ignition advance. Then check the valve clearance (if there is no clearance, adjust the valves), clean the air intake filter element, and make sure that the accelerator pedal link has the required free travel - see Chapter 12.2.

Use a needle to remove the plug covering the fast-idling screw and let the engine run at about 2,000 r. p. m. to attain an oil temperature of 70 °C. Insert the probe of the thermometer into the hole for the oil dipstick.

Now connect the speed indicator (tachometer) and the analyzer of carbon monoxide (contained in exhaust fumes). Use the air-correction screw (Fig. 15.3/9) to set the speed at 800 $^{+30}_{-20}$ r. p. m. and the fast-idling screw (Fig. 15.3/10) to adjust the content of carbon monoxide to 2+0.5 % or the air-fuel proportion-by-weight mixing ratio, comparable with the specified carbon monoxide content, to 14.2 $^{+0}_{-0.3}$.

After about one minute of the continued idle running recheck the adjustment and correct it, if necessary. Close the hole with the fast-idling screw by driving in a new plug with its bottom outward.

Note: For the basic position of adjusting screws refer to Chapter 2.19 - "Maintenance and Adjustment".

To Lubricate Accelerator Mechanism

Pour several drops of oil into the end of the bowden cable tubing and lubricate both joints (on top and below) of the carburettor pull-rod itself with about one drop of oil. Then depress

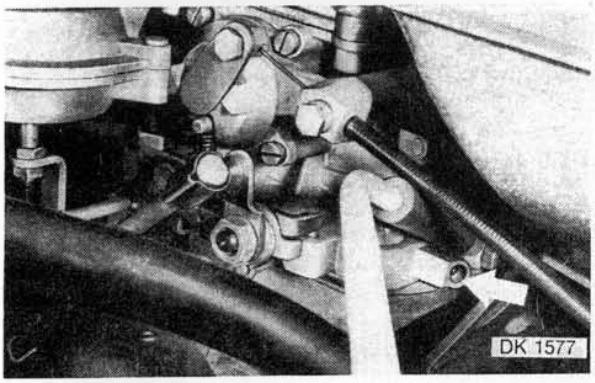


Fig. 15.3/10 - Fast-idling Screw - access to it is closed with a plastic plug

slowly the accelerator pedal several times to let the pull-rod carry the oil further into the bowden tubing.

To Clean Carburettor Strainer

Remove the plug screw at the fuel inlet, lift away the strainer, swill it in petrol and blow it off. Then place it on the plug screw with the slipped-on seal and reinstall it with the aid of the plug screw so that it fits snugly into the respective recess.

To Clean Fuel Pump Sludge Bowl

Back off the nut of the yoke (cover band) at the bottom of the bowl and lift away the bowl including the screen and seal. Wash the screen in petrol and reinstall it with the seal into the bowl. Secure the bowl in position by tightening the nut of the yoke.

If necessary, prime the pump with fuel by actuating the priming lever. Then pull the lever upwards till it clicks home in its locked position.

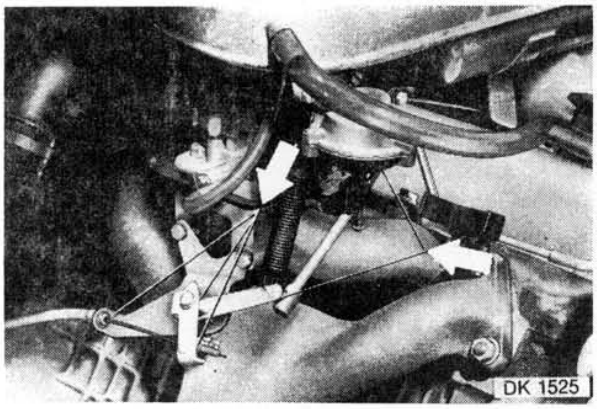


Fig. 15.3/11 - Fuel Lift Pump

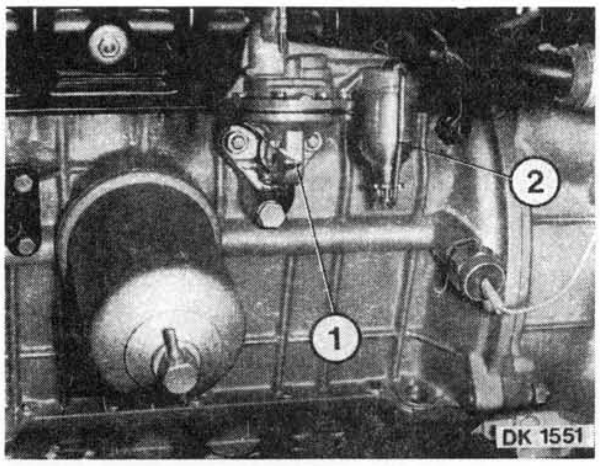


Fig. 15.3/9 - Lubrication of Accelerator Mechanism
1 - pump priming lever
2 - sludge bowl with screen

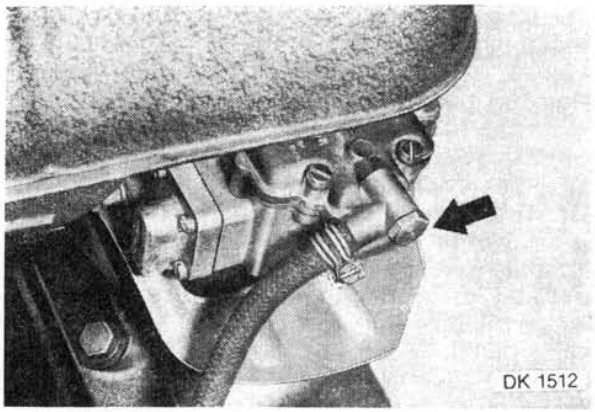


Fig. 15.3/10 - Carburettor Strainer

15.4 CLUTCH

Lubrication

Remove the centre cover of the floor board in the luggage compartment behind the rear seats, then swing away the spring and lift away the bakelite cover of the clutch release cylinder. Pour 10 to 12 drops of oil into the centre recess of the clutch release lever from which the oil will flow down into the oil well of the release sleeve of the clutch release (throwout) bearing, or pour the oil direct on the felt in the sleeve oil well.

Adjustment

The necessary play of the throwout mechanism decreases gradually with the wear of the

friction facing. Inadequate play results in a too short free travel of the clutch pedal and an almost immediate clutch disengagement. Access to the release cylinder can be gained as described in the previous paragraph on clutch lubrication. Hold the rod protruding from the relase cylinder and force from it carefully the release lever, against which it is resting; the lever can be relieved by disengaging the tension (pull-off) springs.

In service, the forcing-off must be at least 2 mm. Adjust it to 4 to 5 mm by adjusting the length of the rod. After having loosened the nut on the rod of the release cylinder, rotate the release finger to obtain the correct rod length. Then retighten the nut, thus locking the release finger in its position on the rod.

If the play is correctly adjusted, the free travel of the clutch pedal pad should range from 40 to 50 mm. It should not be allowed to drop below 10 to 15 mm. If the described adjusting procedure fails to bring the required result, it is necessary to adjust the clutch mechanism in accordance with information contained in Chapter 3.2.

Bleeding the Clutch Hydraulic System

The movement of the clutch pedal is transmitted hydraulically to the clutch release cylinder. The causes and symptoms of penetration of air into the hydraulic system (similar to the brake hydraulic system) are described in detail in the section dealing with brakes. The procedure of bleeding the clutch is the same as when bleeding the brakes - see Chapter 15.8.

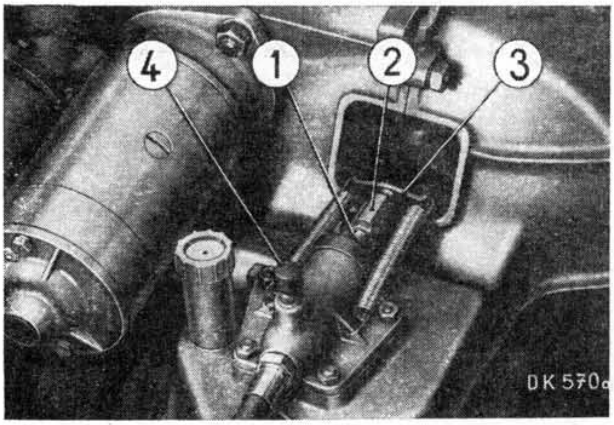


Fig. 15.4/1 - Adjusting Elements of Clutch Control Mechanism

1 - release cylinder rod, 2 - release cylinder, 3 - release lever, 4 - bleed screw

15.5 GEARBOX AND FINAL DRIVE UNIT

Checking Oil Level and Topping-up Oil

Remove the centre cover of the floor board in the luggage compartment behind the rear seats. Pull off the filler neck cap and use the dipstick to check the oil level. With the dipstick inserted into the neck up to its sealing ring, the oil level should be about 8 mm above the upper line.

For this check, the car should be placed on level ground. After having topped up the oil, wait about 2 minutes (while oil flows from the gearbox proper into the final drive and its level is stabilized), and then recheck its level.

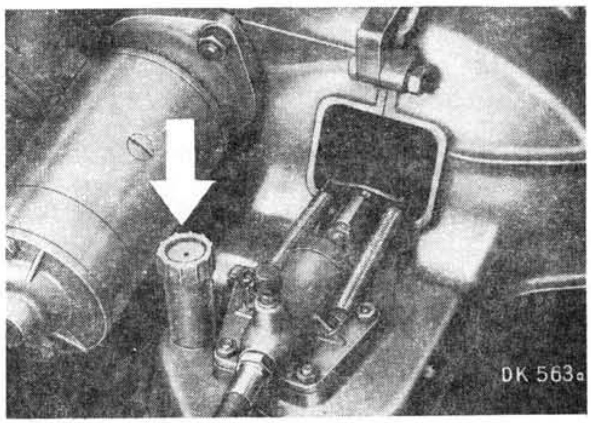


Fig. 15.5/1 - Transmission Unit Filler Neck

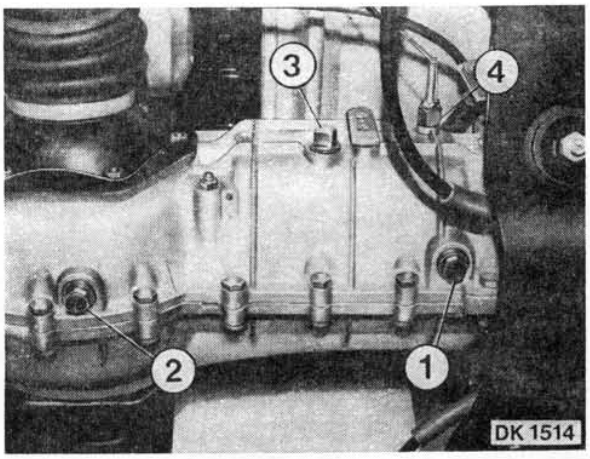


Fig. 15.5/2 - Transmission Unit Drain Plugs and Inspection Plug

1 - gearbox drain plug, 2 - final drive drain plug, 3 - inspection plug, 4 - switch of reversing lamps (except ŠKODA 105 S)

The inspection hole can be also used for checking the oil level and topping up. Inject a small amount of oil into the hole, stop the hole, and uncover it after about two minutes. Let surplus oil flow out. If, however, no oil comes out of the hole, repeat the top-up and checking procedure.

Oil Change

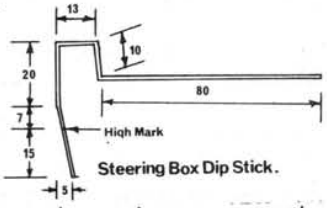
Unscrew the drain plugs and let all oil flow out. Then screw in perfectly cleaned plugs and fill in 2 litres of fresh oil through the filler neck (see the above checking and topping-up instructions). Check the oil level after it has stabilized.

The power transmission unit can be filled with oil also from below in that you inject it into the inspection hole and immediately stop the hole. Again let the oil level stabilize and check it.

Refer to the note on oil sump drain plug for the sealing and tightening of drain plugs and the inspection screw.

15.6 STEERING

Topping up Oil in Steering Box



Remove the spare wheel to gain access to the screw plug of the steering box, screw out the plug. Check oil level with dip stick manufactured as shown below. Top up as required.

Elimination of Steering Linkage Play

Disconnect steering rods from the track rod, lubricate steering joints with grease (see Chapter 7.5), reconnect them and lock in position. Eliminate any play likewise in accordance with instructions contained in the Chapter 7.5.

Steering Joints

All steering joints are lined with self-lubricating bearing metals obviating lubrication. Occasionally, especially at the onset of the cold season, examine the rubber sealing cups for condition. If they are damaged, renew them immediately and pack the bearings with fresh grease - see Chapters 7.5 and 7.6.

Steering joints are adversely affected by dirt and water.

15.7 FRONT AXLE

Wheel Bearing Clearance

Jack up the car and swing the wheel up and down or push it down and pull it up alternately. A free movement should be practically non-existent.

For adjusting the clearance of wheel bearings, see Chapter 6.5, paragraphs 24 to 26.

Lubrication of Wheel Bearings

Remove the wheel hubs from the axle. Repack the bearings with fresh grease after having removed the old grease.

Refer to the chapter 6.4 for removal of the wheel hub and to chapter 6.5, paragraphs 24 to 26 and 41, for the required amount of grease and adjustment of the bearing clearance.

Lubrication of King Pins

Grease nipples are accessible from under the car. There is one grease nipple on either side.

The purpose of the application of grease is not lubrication since the bearings are of the

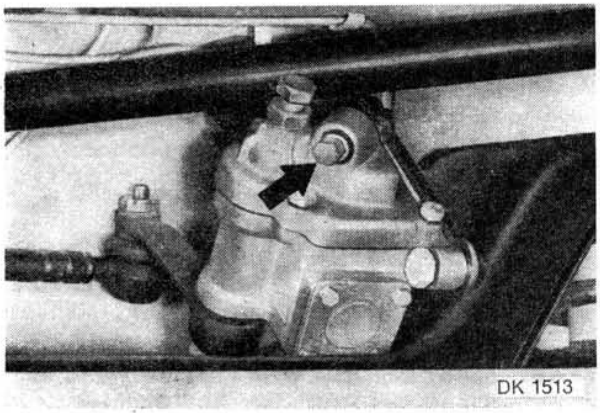


Fig. 15.6/1 - Steering Box Filling Hole

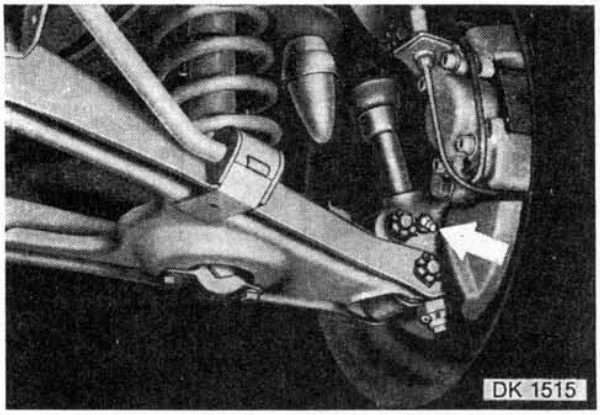


Fig. 15.7/1 - Grease Nipples for King Pin Lubrication

self-lubricating type but the grease is intended to rid the bearings of any moisture which may get to them past the seals in certain circumstances. Apply the grease gun till the lubricant seeps past the upper rubber cup.

Front Wheel Toe-in

For measuring and adjusting the toe-in, see Chapter 6.1.

Elimination of King Pin Play

Remove the coter pin of the king pin nut and rotate the nut to the next cotter pin hole position. If the play is not eliminated and no friction sets in with the nut in this position, continue rotating it until this condition is achieved - see Chapter 6.5, paragraph 21. Lock the nut in the final position with the cotter pin.

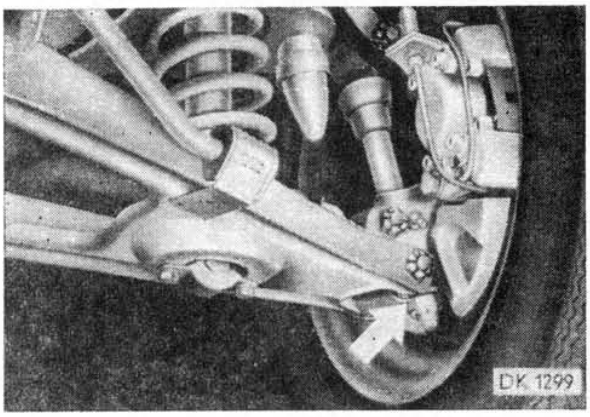


Fig. 15.7/2 - King Pin Hold-down and Adjusting Nut

Note:

In the list of servicing (maintenance) jobs, the paragraph on "Checking Front and Rear Wheel Brakes" includes

a) inspection of the brake-shoe lining and its replacement, if necessary
b) in the case of the front brake, the cleaning and inspection of the protective (dust) cups of pistons acting on the brake pads (shoes), in the case of the rear brake, the inspection of the wheel cylinder dust cups (boots), and in both cases the replacement of damaged parts.

15.8 BRAKE SYSTEM

Brake Fluid Tank - filling

The brake fluid tank is installed in the boot (main luggage compartment) and closed with a screw cap. It serves also the clutch hydraulic control system.

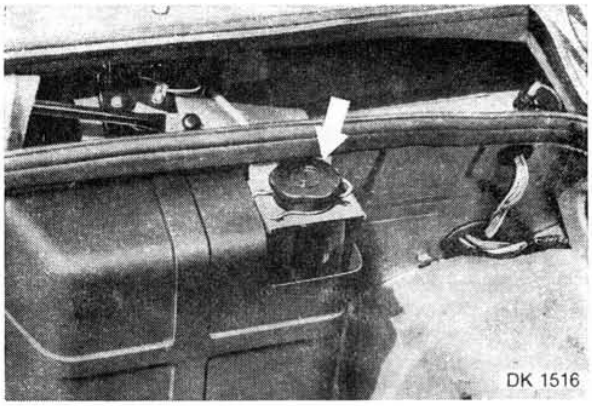


Fig. 15.8/1 - Brake Fluid Tank

Keep the brake fluid level within the range of the maximum filling, i. e., not lower than 10 mm below the "MAX" mark or so high that it just covers the partition wall of the tank which can be seen on looking inside the tank.

Observe absolute cleanliness when filling in the brake fluid through the screen in the tank filler neck. Refer to Chapter 15.2 for recommended brake fluid brands.

For brake fluid handling precautions, see Chapter 9.9.

Brake Fluid Change

The brake fluid absorbs atmospheric humidity and the change of its properties is apt to affect braking and even bring about corrosion of some parts of the brake system.

The time period, in which these changes can take place, cannot be defined with any precision. Therefore forestall troubles and change the brake fluid in the brake and clutch system every few years (preferabley two to three years).

Suck out the old fluid from the tank, fill in fresh fluid, and remove the bleeding screws one after another to let the old fluid be forced out by the fresh one from all branches of the brake line to the clutch - see the brake and clutch bleeding procedure.

Brake Bleeding

Air can get into the hydraulic system of the brakes either due to lack of the brake fluid in the tank (low level) or when removing or dismantling some parts of the hydraulic line. If there is a small amount of air in the hydraulic system, the pedal brake feels "spongy" and the brake efficiency decreases. Ingress of a large

amount of air results in a "spongy" action of the brake pedal thoughout its entire travel and a complete loss of braking effect.

When bleeding the brakes, first top up the brake fluid in the tank, and then clean the bleeding screw of the wheel cylinder and the adjacent surfaces. Remove the rubber cap of the screw and replace it with a rubber tube. The bleeding screw of each of the front brakes is located behind the brake hose (see Fig. 15.8/2), that of the rear brakes is above the hose connection. Fill a clean vessel, preferably a glass jar, partially with the brake fluid and submerge in it the end of the tube connected to the bleeding screw. Now loosen the screw, depress fully the brake pedal, and retighten the screw. As the pedal should be released only after the bleeding screw has been fully tightened, you will need the assistance of another person. Repeat this procedure till air bubbles stop escaping from the end of the tube submerged in the glass jar. Take care to hold the jar as high as possible with the end of the tube submerged in the brake fluid all the time. It is necessary to bleed always the brakes of all four wheels.

During bleeding, watch the brake fluid level in the tank and top it up in good time to prevent sucking in of air; use only fresh brake fluid.

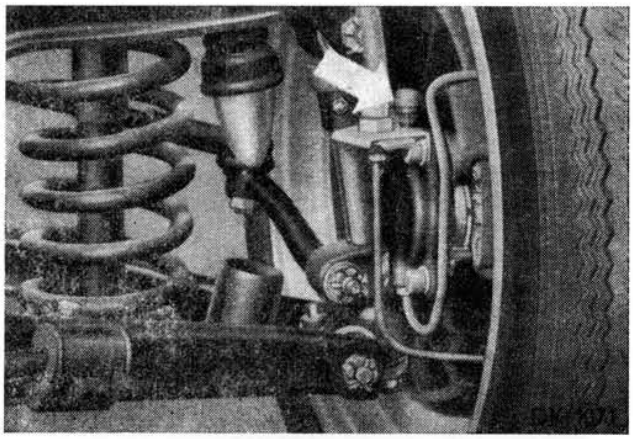


Fig. 15.8/2 - Bleeding Screw of Front Axle Brake

Examination and Renewal of Brake Lining

Front axle - refer to Chapter 9.2 "Brake Pads" when assessing the condition and necessity of renewal of brake lining. Be sure to refit reused brake pads in their original positions.

At the same time, clean the adjoining surfaces of the pistons acting on the pads, and examine their dust cups for condition. At any indication of the slightest damage, renew the dust cups.

Rear axle - access to the brake shoes is gained after removing the wheel hub. For assessing their condition and the necessity of their renewal, refer to Chapter 9.1.

Replacing Piston Protective (Dust) Cups

Prise off the fastening ring and remove damaged dust cups of pistons acting on the front disk brake pads. Then install the new dust cup on the piston and force the piston into the wheel cylinder using the MP 6-134 expanding lever. After having fitted the other edge of the dust cup in position, coat it with brake fluid, and install and centre the fastening ring.

Apply the jig shown in Fig. 15.8/3 on to the ring and use again the expanding lever to force the ring home into its position on the wheel cylinder and the dust cup.

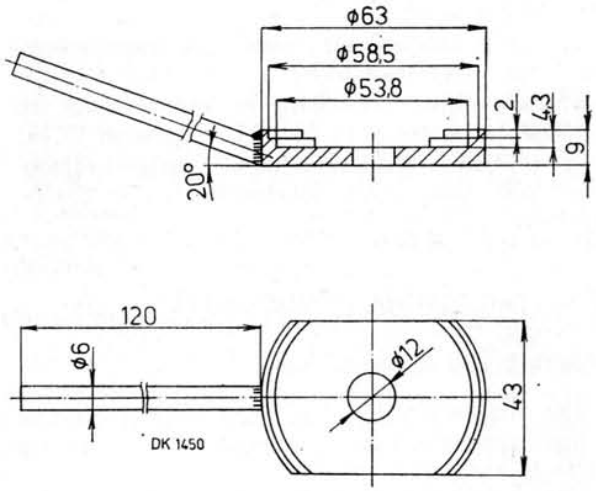


Fig. 15.8/3 - Mounting Plate of Dust Cup Fastening Ring

Hand Brake Adjustment

Free travel of the hand brake lever increases with the progressing brake lining wear and stretching of the brake cables. If the travel becomes excessive and the brake efficiency is decreasing, it is necessary to shorten the cables. For detailed instructions, see Chapter 9.8.

15.9 GEAR CHANGE MECHANISM

To Lubricate Gear Lever Housing

it is necessary to remove it from the car - see Chapter 12.3.

Dismantle the housing, remove old grease, clean the individual parts, apply fresh grease, and reassemble the housing. Soak the felt rings on the links (pull-rods) in engine oil.

15.10 WHEELS AND TYRES, SNOW CHAINS

Tyre Inflation, Balancing and Interchange of Wheels

The procedures are outlined in Chapters 10.1 through 10.3. Snow chains and their use are dealt with in Chapter 10.6.

Wheel Toe-in - see Chapter 16.1.

Shock Absorbers - see Chapter 8.3 "Shock Absorbers".

15.11 ELECTRICAL EQUIPMENT

Checking electrolyte level and topping up – see Chapter 13.2.

Sparking plugs - electrode gap adjustment, etc. - see Chapter 13.7.

Starter motor - examination and renewal of brushes, etc. - see Chapters 13.11 through 13.14.

Ignition timing, adjustment of contact breaker point gap, distributor lubrication - see Chapter 15.3.

15.12 BODYWORK - UNDERBODY

Washing and Maintenance

The visible parts of the body are finished in a hard synthetic baking varnish, the remaining parts in synthetic varnish.

The underbody is spray-coated with a plastic compound - for detailed information, see Chapter 14.9. Follow the usual procedures when washing, cleaning and polishing the car, and observe the specific instructions for the use of washing and cleaning preparations, issued by their manufacturers.

All lights with the exception of headlamps have casings of plastic materials and they should be cleaned only with water or shampoos.

When hosing down the car, cover the voltage regulator of the alternator and the ignition coil to protect them against splashing with water, and do not spray water direct on the door lock and the lid covering the fuel tank filler neck.

Washing and Care of Underbody Mechanisms

The underbody mechanisms are protected with a synthetic varnish which stands well the usual washing procedures. Protect all rubber parts against direct contact with special chemical solvents or limit the duration of this contact to a minimum before a complete washing off of the solvents with water (by hosing down, etc.).

Keep the oil cooler, if fitted on the car, in clean condition. Hose it down when washing the car, and if dirt still sticks to the cooling surfaces, use some of the detergents.

Bodywork Lubrication

Routine maintenance includes the lubrication of door hinges and limiters, hinges and release mechanisms of the engine bonnet and boot lid, the release mechanism of the spare wheel, and the leverage of windscreen wipers. Lubrication of inner door mechanisms is included in special maintenance.

Lubricate all accessible mechanisms with high-quality greases which do not dry, do not oxidize, and protect the mechanisms against corrosion for a long time. Oil is not suitable due to its short-time effect. Any grease can be used to lubricate the door limiters and the front seat slide rails.

Lubrication of Spare Wheel Carrier Bearings – Remove the spare wheel, clean the hinges, and apply oil on their upper sides. In addition, rub in grease of any brand.

Lubrication of Windscreen Wiper Leverage – Remove the cover of the joint (a plastic cup), fill it with grease, lubricate the joint, and reinstall the cover.

The Lubrication of Inner Door Mechanisms is possible only after removing the door panel and the inner door mechanism. Use only recommended grease brands. Lubricate the bowden cable of the window wind-up mechanism with

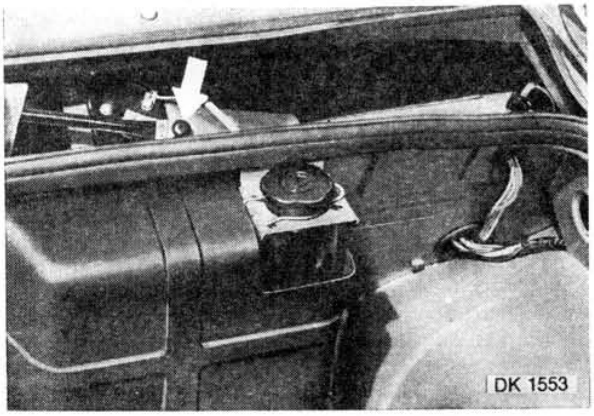


Fig. 15.12/1 - Lubrication of Windscreen Wiper Leverage Joint - joint cover

engine oil using only as much oil as can be held (sucked-in) by the bowden cable.

To Clean Upholstery

Stains and dirt are best removed from upholstery and covers of plastic materials with lukewarm water and soap. Special cleaning agents are also available.

Textile upholstery should be cleaned with cleaning agents for synthetic fabrics depending on the origin of the stains. Never use petrol which could cause the separation of the layers of some laminated fabrics.

Removing Tar Spots

Remove tar spots from the body with a cloth dipped in kerosene, turpentine, or a special tar remover. Immediately after the tar spot has been removed, wash away all traces of the chemicals.

Filling Windscreen Washer - see Chapter 13.14.

15.13 COOLING SYSTEM AND HEATER

A low freezing-point coolant is used in the system throughout the year. In the factory, the system is filled with the Fridex Spolana glycol-based antifreeze for ambient temperatures down to −25 °C or lower upon a special agreement with the customer. The service life of the filling is 2 to 3 years, unless deteriorated by being replenished with an unsuitable kind of liquid etc.

With a new filling, a certain margin for the lowest temperature in winter should be reckoned with. For the Central European region, the mixture should be prepared for −20 to −25 °C.

In frostless regions, use a liquid diluted for approx. −10 °C in order to ensure a filling without corrosive action, i. e. to prevent the formation of corrosion in the system (high-quality antifreezes contain corrosion inhibitors). Therefore do not fill with water only.

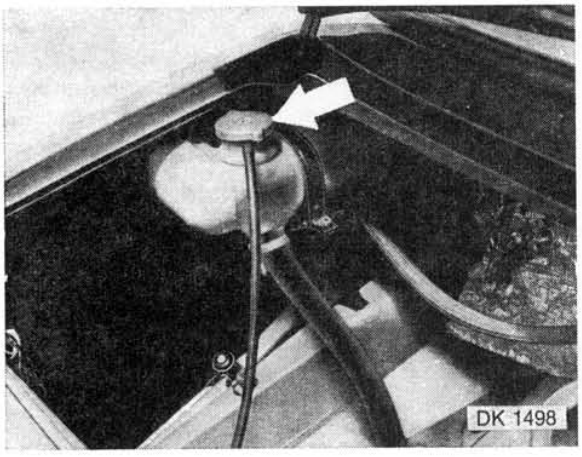


Fig. 15.13/1 - Coolant Tank Filler Cap

Replenishment of Antifreeze Mixture

Remove the cap (turn it slightly to the left and, after loosening, depress it and then turn again) and replenish the evaporated portion with clean soft water. Replenish other losses with a newly prepared antifreeze mixture of the same grade as that of the original filling or with a liquid which cannot chemically deteriorate the original filling.

The level of the liquid in cold condition should reach approximately half of the storage tank in the engine space, i. e. the index line on the tank dividing seam, with an accuracy of about ± 10 mm. If the tank is marked with the symbols "MAX" and "MIN" (again in the vicinity of the dividing seam), keep the coolant level between these marks. For the coolant tank used in tropical regions, see Chapter 16.2.

Before opening the tank after a trip, particularly in a mountainous region, make sure that the liquid is not boiling (hot steam escapes through a vent spout under the vehicle), and only then remove the cap. If it is boiling, let the engine idle for a while till the coolant temperature drops, in order to avoid injury by scalding.

Filling After Draining the Cooling System

After closing all drain openings opened previously for draining the system, and after refitting the guard sheet of the fuel tank, check whether the heater valve and the vent cock are open. Then slowly fill the storage tank up to the required level and close the cock and the tank. After the engine has been running for a short time, check the level in the tank and, if necessary, replenish the liquid to the specified level.

Draining the Cooling System

1. Open the storage tank and the bleed cock under the luggage boot lid, i. e. the cone pin will be level with the connected hoses, and open the heater valve by means of the heater control lever on the facia.

2. Remove the guard sheet of the fuel tank from underneath the vehicle and two drain plugs on the main pipes of the cooling line, and collect the cooling liquid into vessels. If the liquid does not flow freely, clean the piping with a wire etc. (when draining the liquid for the first time, it may happen that the outlets are plugged by a film after the galvanizing of

the pipes). The greater portion of the filling will flow out through the outlets and this will suffice in the event of draining before dismantling the engine.

3. Uncouple the hoses from the engine line in the engine bay - See Fig. 15.13/4. Proceeding from under the vehicle, pull the hoses behind the cross bearer of the gearbox, and let the liquid flow from the hoses.

4. Remove the drain plug of the cylinder block and, if necessary, free the out-flow using a length of wire, etc.

Note: In all, about 85 % (10.5 litres) of the coolant will flow out, and the difference should be reckoned with when refilling the system.

All antifreezes are to a certain extent harmful to the skin. It is therefore necessary to protect oneself against contact with the liquid, especially the eyes (do not touch them with

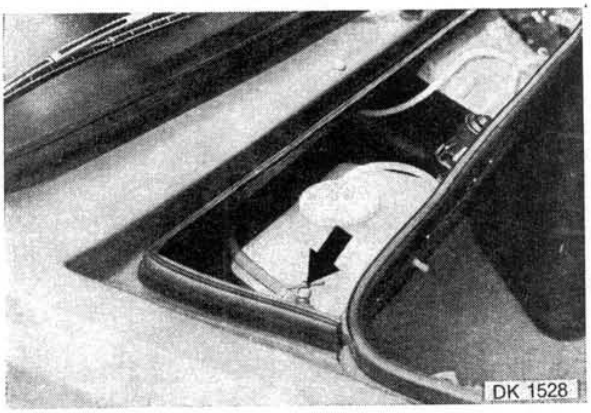


Fig. 15.13/2 - Cooling System Bleed Cock

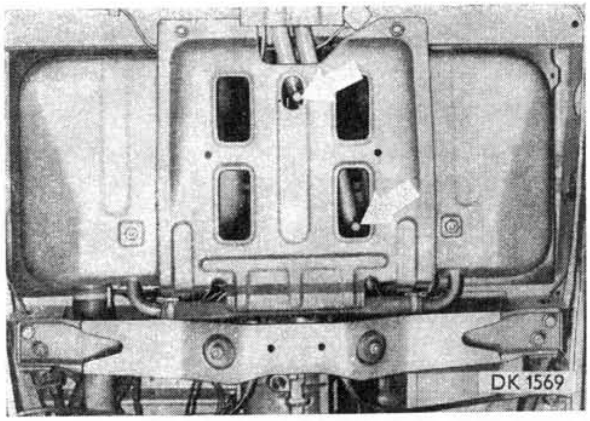


Fig. 15.13/3 - Fuel Tank Guard Sheet and Pipe Drain Plugs

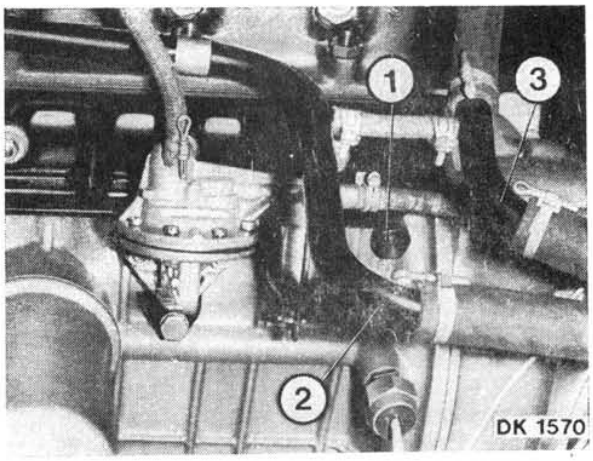


Fig. 15.13/4 - Heater Line on Engine and Drain Plug
1 - drain plug
2 - pump and heater connecting line
3 - thermostat and heater connecting line

fingers soilded with the liquid). Wash any stains off the skin as quickly as possible with soap water etc. Rinse the stains off the varnished car body with water.

Fridex-Spolana Antifreeze

As already mentioned, the cooling system is filled with this liquid, or with a solution of its concentrate with soft water, in the factory.

For the preparation of this solution always use soft and clean water. In the following table, its concentration in dependence on its freezing resistance is indicated. Alternatively, the concentration can be determined from the density.

Volume Parts		Density at +20 °C	Freezing point °C
Fridex Spolana	Water		
21	79	1.029	−10
1	2	1.049	−20
38	62	1.055	−25
1	1,5	1.057	−27
44	56	1.062	−30
47	53	1.067	−35
1	1	1.074	−40
53	47	1.080	−45
1,5	1	—	−60

16-SPECIAL EQUIPMENT

16.1 EQUIPMENT FOR SUBTROPICAL REGIONS

Standard equipment of cars for subtropical regions where the temperature does not exceed +40 °C, or where increased cooling efficiency is required generally:

1. Copper radiator (copper laminations) for all types.

2. Oil cooler for all types, the same as that fitted in the standard 120 LS model.

3. Cast finned oil sump for all types including accessories (longer oil pump suction strainer and longer oil dipstick), like that fitted in standard 120 L and 120 LS models.

4. Oil temperature signalling telethermometer (125 ± 3 °C) in car type Š 120 LS. The primary element is mounted in a special connection fitted to the oil cooler outlet. The warning lamp on the instrument panel is red and without a symbol (the instrument panel has a different wiring for the connection of the warning lamp to the terminal board).

The cable of the primary element is connected to the terminal "10" of the terminal board "111" (marking according to wiring diagram in Fig. 13.1/1). The cable is led out at the engine together with cables to the engine temperature gauge and the oil pressure switch.

16.2 EQUIPMENT FOR TROPICAL REGIONS

Standard equipment of cars for tropical regions where the temperature does not exceed +50 °C, or where an extra high cooling efficiency is required generally:

1. Copper radiator (copper laminations) for all car types.

2. Oil cooler for all types like that fitted in standard Š 120 LS model. The bolt connecting the radiator hose of the outlet from the engine timing gear cover to the radiator has, however, no by-pass holes.

3. Cast finned oil sump for all car types – refer to Chapter 16.1, paragraph 3.

4. Oil temperature signalling telethermometer (125 ± 3 °C) for types 120 L and 120 LS. For layout see Chapter 16.1, paragraph 4.

5. Thermostat with a nominal opening temperature of +75 °C for all types.

6. Increased volume of coolant (storage) tank – 4 litres for all types.

7. Fuel pump with a longer priming lever. It is installed on the engine on two insulating pads.

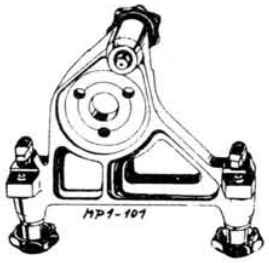
Maintenance of air cleaner:

The standard air cleaner filter element (the same for all car types) must be changed in dust-laden environments after every 2,000 kilometres. On dusty roads in deserts, this element must be inspected daily and replaced daily, if necessary.

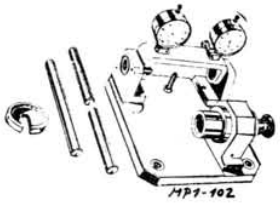
Keep the coolant level at about the middle of the tank or only slightly above the middle. The total volume is 13.5 litres approximately.

17 - SERVICE TOOLS

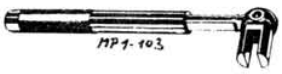
17.1 ENGINE



MP 1-101 **Engine bracket**

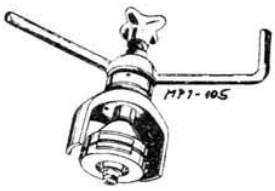


MP 1-159 **Connecting rod checking instrument**

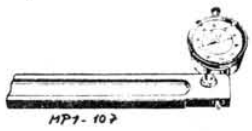


MP 1-103 **Connecting rod straightener**

MP 1-104 **Gudgeon pin drift**

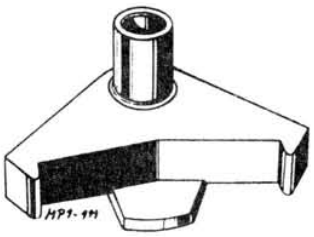


MP 1-105 **Cylinder (liner) extractor**

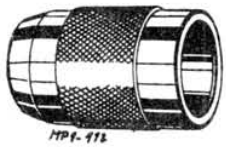


MP 1-107 **Cylinder (liner) interference gauge**

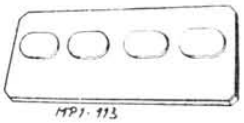
MP 1-109 **Crankshaft bush extractor**



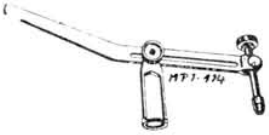
MP 1-111 **Flywheel catch**



MP 1-112 **Thrust bearing supporting bush**



MP 1-113 **Valve supporting plate**

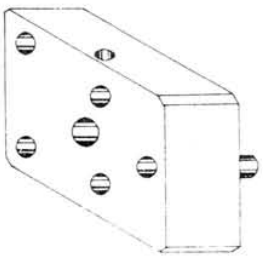


MP 1-114 **Valve spring installer**

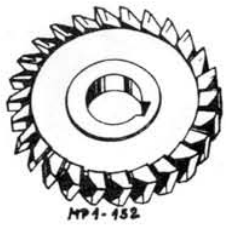
MP 1-121 Water pump shaft drift

MP 1-122 **Water pump bearing drift**

MP 1-123 **Water pump bearing drift**



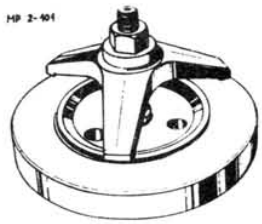
MP 1-128 **Gauge for carburettor throttle disks**



MP 1-152 **Reamer cutter**

MP 1-157 **Cylinder seating face reamer** (cutter MP 1-152 not included – available to separate order)

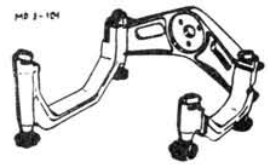
17.2 CLUTCH



MP 2-101 **Clutch fitting plate**

MP 2-102 **Clutch plate centering pin**

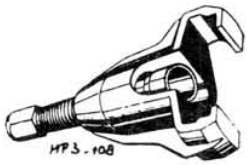
17.3 GEARBOX



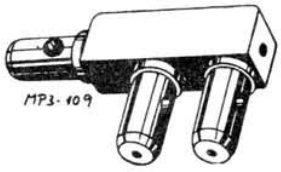
MP 3-101 **Gearbox bracket to MP 9-101**

MP 3-112 **Extractor, clutch release sleeve guide.**

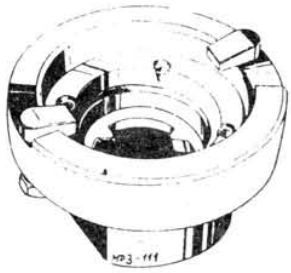
MP 3-103 **Drift, clutch release sleeve guide**



MP 3-108 **Pinion bearing extractor**

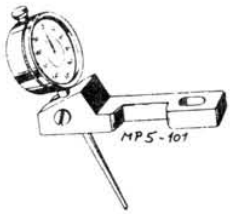


MP 3-109 **Lock pin guides**

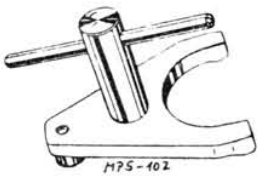


MP 3-111 **Pinion clamping bracket**

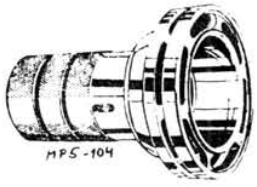
17.4 REAR AXLE



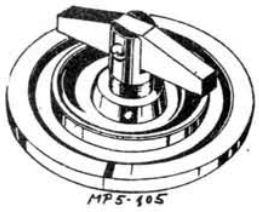
MP 5-101 **Backlash gauge**



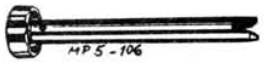
MP 5-102 **Pinion bearing retaining fixture**



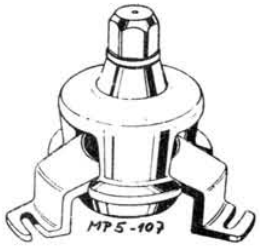
MP 5-104 **Differential adjusting support (2×)**



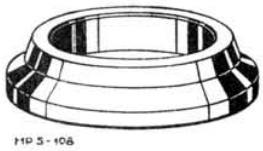
MP 5-105 **Bearing measuring plate**



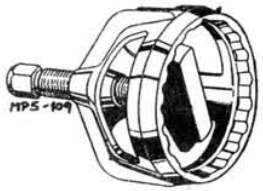
MP 5-106 **Crown wheel rotating spanner**



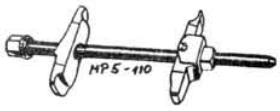
MP 5-107 **Differential bearing extractor (2×)**



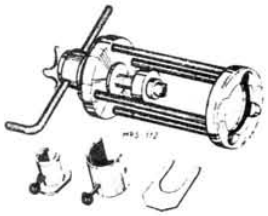
MP 5-108 **MP 5-107 extractor pilot ring**



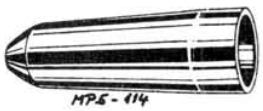
MP 5-109 **Bearing inner race (cone) puller**



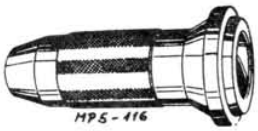
MP 5-110 **Rear road spring installer**



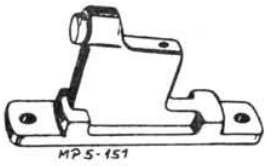
MP 5-112 **Wheel bearing extractor (and fitter)**



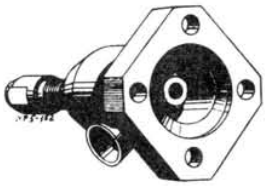
MP 5-114 **Wheel shaft pilot taper**



MP 5-116 **Sealing ring drift**

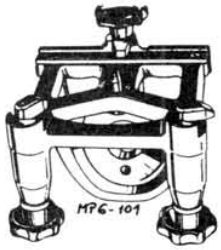


MP 5-151 **Pinion adjusting gauge**

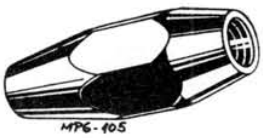


MP 5-152 **Wheel hub puller**

17.5 FRONT AXLE

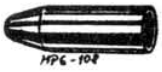


MP 6-150 **Front axle assembly bracket**

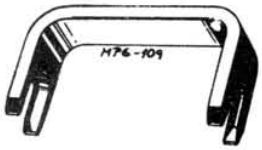


MP 6-105 **Steering arm drift**

MP 6-106 **Front road spring installer** (identical with MP 6-154)

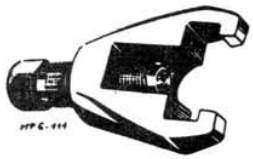


MP 6-108 **Top pin guide taper**

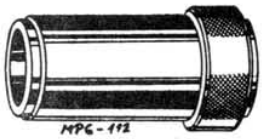


MP 6-109 **Wheel cylinder retaining clip (2×)**

MP 6-110 **Needle**



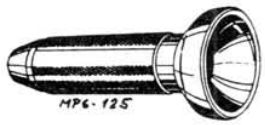
MP 6-111 **King pin socket remover**



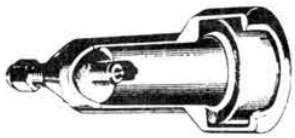
MP 6-112 **Resilient bush pressing mandrel**

MP 6-114 **Dia. 18 mm king-pin bush reamer**

MP 6-122 **Rubber bush drift**

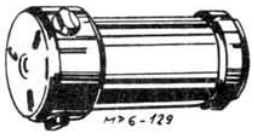


MP 6-125 **Wheel hub cap drift**

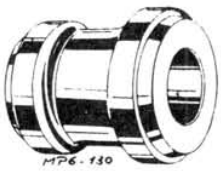


MP 6-126/A **Wheel bearing inner race extractor**

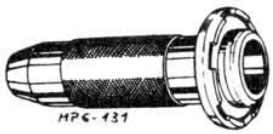
MP 6-127 **Wheel bearing inner race drift**



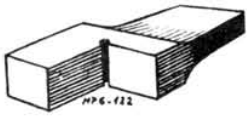
MP 6-129 **Pressing mandrel of wheel bearing outer races**



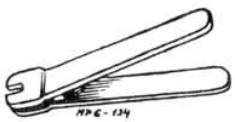
MP 6-130 **Pressing mandrel of wheel bearing outer races**



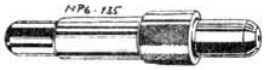
MP 6-131 **Sealing ring drift**



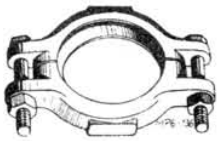
MP 6-140 **Disc-brake gauge**



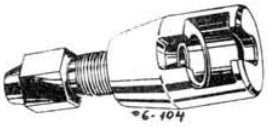
MP 6-134 **Expanding pliers**



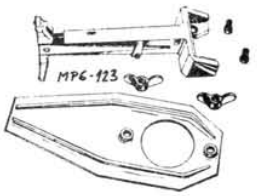
MP 6-135 **Pressing mandrel for king pin bushes**



MP 6-136 **Wheel hub cap puller**

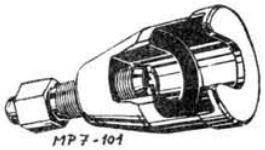


MP 6-138 **Ball joint puller**

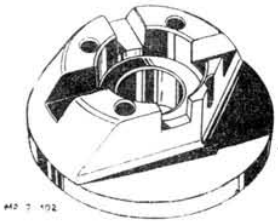


MP 6-139 **Wheel camber adjusting gauge**

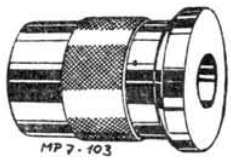
17.6 STEERING



MP 7-101 **Drop arm puller**

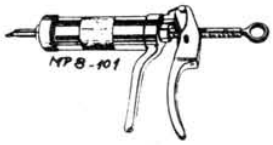


MP 7-102 **Bearing pressing pad**

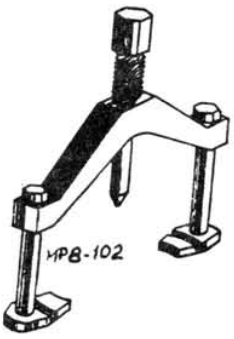


MP 7-103 **Bearing pressing mandrel**

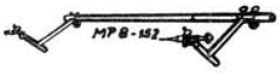
17.7 COMPLETE CAR



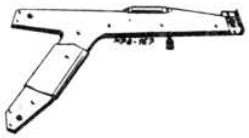
MP 8-101 **Cement syringe**



MP 8-102 **Radiator fan hub puller**

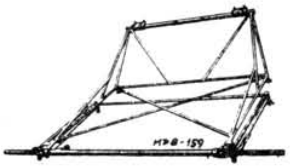


MP 8-152 **Toe-in gauge**

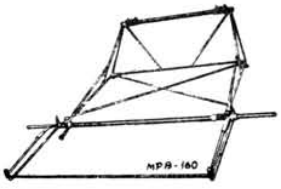


MP 8-157 **Camber gauge**

MP 8-158 **Rear axle alignment check gauge**



MP 8-159 **Check gauge for underbody (front)**

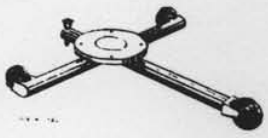


MP 8-160 **Check gauge for underbody (rear)**

MP 8-161 **Window frame moulding fitting fixture**

17.8 MISCELLANEOUS

MP 9-101 **Assembly stand**



MP 9-102 **Assembly stand dolly**

The manufacturer reserves the right to change the fixtures or their design, or to strike out those which can be replaced by other means or aids.

REFERENCES AND AUTHORSHIP

Jaroslav Andert: Part 14 - Bodywork

PAL National Corporation:
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PAL-MAGNETON National Corporation:
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